DOCUMENT RESUME

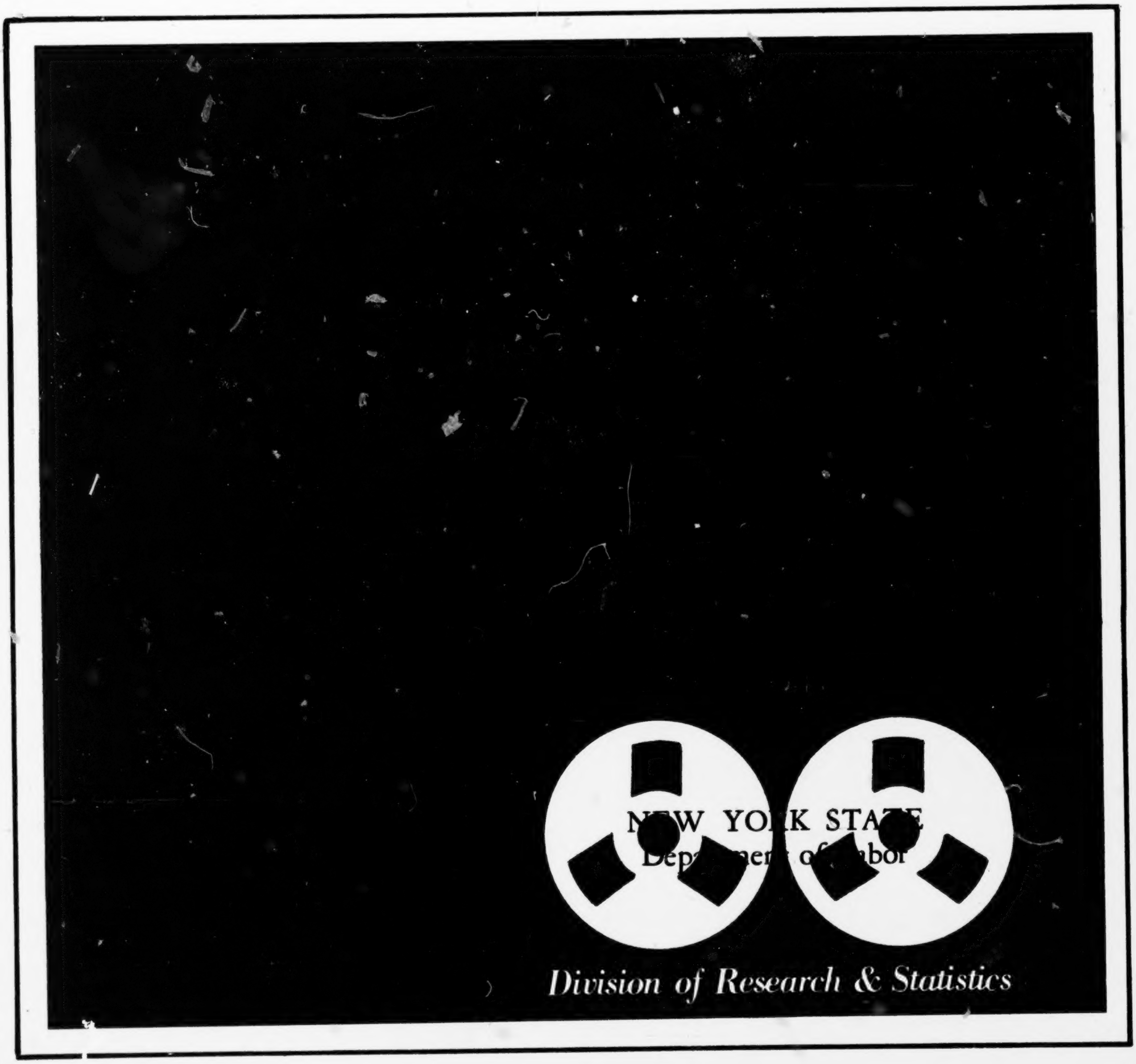
ED 033 215 VT 009 285

Manpower Impacts of Electronic Data Processing.
New York State Dept. of Labor, Albany. Research and Statistics Office.
Report No-Pub-B-171
Pub Date Sep 68
Note-122p.
EDRS Price MF-$0.50 HC-$6.20
Descriptors-*Automation, *Electronic Data Processing, Employment Level, Industrial Structure, *Industry, Job Skills, Labor Problems, Manpower Needs, *Manpower Utilization, Skill Obsolescence, Tables (Data), *Technological Advancement
Identifiers-*New York

This report presents the findings of a survey of personnel changes resulting from the installation of electronic-data processing equipment. It is concerned primarily with (1) the nature and source of staff in electronic-data processing units, and (2) the extent and nature of staff displacements resulting from the introduction of electronic-data processing (EDP). Data were gathered on 13,743 persons in 277 establishments which employed 527,000 workers during 1962 and 1963--approximately 50 percent of all workers in establishments with FDP installations at that time. The survey found that staffing of EDP units was largely accomplished by utilizing existing employees rather than recruitment from outside sources: 48.6 percent were transferred with no substantial change in duties: 27.1 percent were reassigned with substantial change in duties: and 24.3 percent were newly hired personnel. In most transfers, skill requirements remained about the same; however, there were instances of upgrading, but downgrading rarely occurred. A companion document, published in 1969, is available as VT 008 863. (CH)

ED 033215

ANPOWER IMPACTS OF ELECTRONIC DATA PROCESSING



NEW YORK STATE
Department of Labor

Division of Research & Statistics

VT009285

MANPOWER IMPACTS
OF ELECTRONIC DATA PROCESSING

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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Publication B-171
September 1968

Library of Congress Card No. 76-625562

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PREFACE

This report on manpower changes resulting from the installation of electronic-data processing equipment was undertaken because EDP is by all odds the most widely utilized form of automation, and therefore has claim to priority among studies of manpower effects of contemporary technological developments.

The report covers installations in New York State during the five-year period preceding 1962 -- during the first rush of private business and government into this method of data processing and record keeping. Field work on the project was carried out in 1962 and 1963, as an incident to a New York State Department of Labor Survey of technical manpower in New York State. 1/

The survey findings, while referring to an early period in EDP development, have the advantage of reflecting the manpower changes that took place in many large establishments that had had no previous EDP equipment. They may not describe as well the extent and kind of manpower changes involved in the present generation of computer installations. This report has been prepared on the assumption, however, that the earlier experience has historical value and also that it is suggestive of the dimensions and sorts of changes that have occurred and are occurring under installations in more recent years.

The survey was carried out under the direction of Charles A. Pearce, Director of the Department's Division of Research and Statistics. The report was prepared by William Gibelman, Assistant Director of the Division. Harold Loeb, Associate Economist, supervised the greater part of the field work done during the course of the survey.

The report is a companion volume to a report of the Division on industrial technology. 2/

M. P. CATHERWOOD
Industrial Commissioner

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1. New York State Department of Labor, Division of Research and Statistics, Technical Manpower in New York State (four volumes, 1965).

2. New York State Department of Labor, Division of Research and Statistics, Manpower Impacts of Industrial Technology (1969).

HIGHLIGHTS

This report presents the findings of a survey of personnel changes resulting from the installation of electronic-data processing equipment. It is concerned primarily with (1) the nature and source of staff in EDP units and (2) the extent and nature of staff displacements resulting from the introduction of EDP.

The findings are based on data obtained during the years 1962 and 1963 from 277 establishments, employing 527,000 workers, in New York State. The data pertain to EDP installations made during a period roughly of five years preceding the time of the survey. The 277 establishments for the most part represent larger establishments from among a total of about 600 of all sizes estimated to have had installations at the time of the survey. These 277 establishments employed around 50 percent of all workers in establishments with EDP installations at that time. It is estimated that approximately 4,100 additional establishments in the State employing approximately 450,000 workers used service agencies or the computer facilities of their own firms located in another establishment.

Generally speaking, it was found that, while many workers are displaced by EDP, most of these are transferred or reassigned to jobs in the new EDP organization or elsewhere in the establishment; so that most separations from employment of affected workers take place through retirements and quits rather than layoffs. The survey found that staffing of EDP units was largely accomplished by utilizing existing employees rather than by recruitment from outside sources. Training played an important role in this process, though formal training typically was of short duration.

The survey also found that the skill level of jobs to which displaced workers were assigned within the establishment for the most part was about the same as the level as of the jobs formerly held, although there were many instances of upgrading. Downgrading rarely occurred.

Composition and Functions of EDP Units

The key component of EDP equipment is the central processor. Most frequently encountered in the present study were the IBM 1401 and IBM 7070. Various models of other manufacturers were found in the establishments studied, including those produced by Bendix Corporation, Burroughs Corporation, Control Data, Clary Corporation, El-Tronics, Inc. (Alwac Division), General Electric Company, National Cash Register Company, Radio Corporation of America, Royal Precision Corporation, Sperry Rand Corporation (Univac Division), and Teleregister Corporation. Associated equipment consisted typically of input devices such as magnetic tape handlers and card or tape readers; storage devices such as magnetic core storage, magnetic drum storage or disk storage; output units such as card punches, tape readers, or printers; and auxiliary devices such as card-to-tape converters, control units, bursters, etc. The EDP unit in addition usually included data recording devices such as key punch machines, tape punches, magnetic ink character inscribers, etc.

Payroll, general ledger, inventory and cost accounting were the principal computer applications encountered in the survey. Found less frequently were sales analysis and market research; production scheduling and control; engineering, product, and statistical analysis; and purchase and sales-order processing.

Organizationally, the EDP unit was usually located in an accounting, finance, or general administrative department, but sometimes in a research, statistics, engineering, or actuarial department. In about ten percent of the cases, data processing had departmental status.

In terms of the number of workers in the establishments involved, there was a heavy concentration of EDP workers in manufacturing, banking, insurance, transportation and public utilities, and government agencies.

EDP Occupations

The figures indicate that 75 percent of the staff was in machine operator or clerical occupations (console operator, peripheral equipment operator, key punch operator, and miscellaneous clerical worker).

The largest single group -- key punch operator -- was utilized for many years in connection with traditional electric-mechanical data-processing equipment.

Less than 20 percent of the staff (programmers, console operators, tape librarians, equipment maintainers) could be said to be uniquely associated with the electronic computer.

Occupation	Number	Percent
All occupations	13,743	100.0
Director or general supervisor	617	4.5
Systems analyst	762	5.5
Programmer	1,383	10.1
Controller or scheduler	425	3.1
Tape librarian	84	0.6
Equipment maintainer	40	0.3
Console (computer) operator	1,145	8.3
Peripheral equipment operator	2,297	16.7
Key-punch operator or data transcriber	5,965	43.4
Miscellaneous clerical personnel (stenos, typists, general and special clerks)	1,025	7.5

The staffing patterns varied from establishment to establishment, depending on types of equipment in use, the applications of the computer, and the way the work was organized. Nevertheless, the EDP units of each major industry group, taken separately, show an occupational pattern generally similar to the over-all pattern indicated by the table.

Sources of Personnel

Around three-quarters of the staff of EDP units at the time of the survey visits had been obtained from personnel in the establishment. About one-quarter were newly hired. A few of the staff were employees of equipment suppliers on loan.

The way data-processing operations were carried on prior to the computer installations covered by the survey had a considerable bearing on the kind of personnel that was available for transfer or reassignment into the EDP unit. Of 291 installations studied (in the 277 establishments):

71 were installations in which computers were substitutes for or supplements to the traditional unit-record, electric-mechanical accounting machine (EAM) equipment.

179 were installations in which a new model of computer replaced or was added to an older one.

41 were installations that took the place of manual data handling (including the use of key-board operated bookkeeping machines and desk calculators).

There were no key punch operators--the largest of the occupational groups in EDP units--to draw on in this last group of 41 installations. They had to be hired. Mainly for this reason, 46 percent of the EDP staff of these units were hired from the outside--a far higher proportion than in the case of the first two categories.

An analysis by occupation shows this picture for all establishments in the survey:

Occupation in EDP unit	Total Number	Total Percent	Newly hired	Transferred (no substantial change in duties)	Reassigned (substantial change in duties)
Total	13,743	100.0	24.3	48.6	27.1
Director or general supervisor	617	100.0	12.7	15.2	72.1
Systems analyst	762	100.0	22.4	26.5	51.1
Programmer	1,383	100.0	37.5	14.6	47.9
Controller or scheduler	425	100.0	19.5	44.7	35.8
Tape librarian	84	100.0	19.0	6.0	75.0
Equipment maintainer	40	100.0	62.5	30.0	7.5
Console operator	1,145	100.0	20.3	11.3	68.4
Peripheral equipment operator	2,297	100.0	16.7	70.8	12.5
Key punch operator or data transcriber	5,465	100.0	26.3	61.3	12.4
Miscellaneous clerical personnel	1,025	100.0	25.8	55.1	19.1

It will be seen that large numbers of key-punch and other clerical workers were transferred to the EDP unit when the computer was installed--simply becoming part of the new unit without change in duties. This shifting was usually a part of a reorganization of data processing operations. In the case of establishments that simply updated an existing EDP installation, however, no reorganization of any consequence may have taken place. For the purpose of this study, nevertheless, persons such as key-punch operators who in these cases continued to perform their former duties in the newly equipped unit were classified as "transferred."

As to persons on the EDP staff whose reassignment from former positions involved a substantial alteration of job duties, a run-down of the various occupation groups shows that the following kinds of changes took place:

Directors and managers

Top-side EDP unit management personnel came primarily from among persons who had been working in an administrative or supervisory capacity. Most of them had had previous data-processing experience of some kind, and many received training for additional responsibility or higher rank. Accountants, engineers, and other professional personnel were a minor source.

Systems analysts

In new EDP installations around half of the systems analysts (some of whom in smaller operations also did programming) were recruited from among accounting, engineering, or other professional staffs. Twenty percent were reassigned from the ranks of administrative and supervisory personnel. Some were recruited from among clerks with specialized experience. In replaced EAM or updated EDP operations, professional and administrative sources were supplemented by the promotion of lower-grade analysts, who were trained for higher level analytical duties and often trained in programming techniques required by the new equipment.

Programmers

The principal occupational source for programmers was peripheral equipment operator. About half the programmers formerly had professional or clerical positions. About ten percent came from the ranks of administrators or general supervisors. The occupations from which programmers were drawn were distributed as follows:

Administration and general supervision	9.8
Professional	22.6
Systems analysts	4.4
Programmer	1.1
Accountant,engineer,other professional	17.1
Machine operation	41.6
Console operator	1.2
Peripheral equipment operator	40.0
Keypunch operator or data transcriber	0.4
Miscellaneous clerical	26.0

Persons reassigned to programmer jobs from other occupations typically were given formal training, usually for four to six weeks. This formal training served as a platform for further learning on the job. Of those who received no formal training or short training, most had had previous programming experience.

Controller or scheduler

The vast majority of controllers and schedulers were reassigned from clerical occupations, especially bookkeeping-machine and other office-machine operator groups.

Tape librarians

This small group of EDP personnel was recruited principally from among peripheral equipment operators and from a variety of clerical occupations.

Equipment maintainers

Few EDP equipment servicemen were employed by the establishments covered in the survey, because such work was done largely by technicians in the employ of the manufacturer. Most of those employed by the surveyed establishments were transferred from other maintenance jobs without substantial change in duties.

Console operators

Approximately 93 percent of all console operators had previously been operators of peripheral equipment--primarily of EAM sorting and tabulating machines. The general clerical group also contributed to the console operator staff. Console operators commonly were given one to three weeks of formal training.

Peripheral equipment operators

In new EDP installations peripheral equipment operators who had previously had different jobs had worked as bookkeeping machine operators or clerks. In replaced EAM units most had been operators of EAM sorters or tabulating machines who were reassigned to the operation of different equipment.

Key-punch operators and data transcribers

A majority of key-punch operators in other jobs prior to the EDP installation were typists, office machine operators, or clerks. Some were upgraded from lower-grade key punch jobs; many of the data transcribers had been bookkeeping machine operators.

Miscellaneous clerical personnel

Other kinds of clerical personnel in EDP units whose duties changed as a result of the installation had been engaged in clerical work, but of a different nature -- for example, an index and policy clerk in an insurance company who had been shifted to general clerical duties in the EDP unit.

Training and Retraining

As has already been indicated, formal training accompanied the reassignment of personnel into many of the EDP unit jobs. The data may be summarized as follows:

Selected occupation group	Typical duration of training (weeks)	Proportion with previous data-processing experience
All occupation groups	3	65.5
Director or general supervisor	3	73.9
Systems analyst	4	55.6
Programmer	4	56.8
Console operator	2	86.8

Information available from 15 establishments that modified their computer installations substantially after the original computer was installed (most substituted more sophisticated equipment for older generation computers or added additional hardware) indicated that the proportion of systems analysts and programmers did not increase after the initial installation, although the total number of workers on the staff increased. The need for peripheral equipment operators declined markedly. The ratio of key punch operators and other input personnel increased slightly.

Jobs Eliminated and Workers Displaced by EDP

The EDP installations covered by the survey resulted in the elimination of the jobs of 9,385 persons--1.8 percent of the employment in the establishments at the time the installations took place. About 70 percent of these people were retained by the firm. The introduction of EDP resulted in the loss of employment by only 2,792. A minority of 628 were laid off. The other 2,164 were reported by employers as workers who quit, retired, or took leave (a few died) at the time of the computer installation or change or within a few months following it. Their former jobs were not filled when they left. It was not always possible to tell whether the quits and retirements were voluntary and so really distinguishable from layoffs.

Where it did not result in separation of workers from employment, job elimation resulted in worker displacement in the form either of transfer or reassignment to jobs elsewhere in the establishment.

A worker was classified as "transferred" if he was assigned to the same kind of job, without substantial change in job duties; "reassigned" if he was assigned to a job differing materially in job content from the one from which he was displaced. Workers in the data-processing unit whose duties remained the same when the character of the installation changed have been excluded from the "transferred" group because they were not displaced.

As can be seen from the following table showing the disposition of persons whose jobs were eliminated, somewhat over half of all the displacements fell in the"reassigned" category:

Disposition of workers displaced	Number	Percent
Total	9,385	100.0
Separated from employment	2,792	29.7
Reassigned	5,036	53.7
To a new or modified EDP unit from a data-processing unit	1,660	17.7
To a new or modified EDP unit from nondata-processing units	758	8.1
To nondata-processing units	2,618	27.9
Transferred	1,557	16.6
To a new or modified EDP unit from nondata-processing units	277	3.0
To nondata-processing units	1,280	13.6

A majority of the reassignments were to units of the establishment other than the EDP unit. An illustration is bookkeeping machine and other office machine operators who were reassigned to other sorts of clerical duties.

Numerically, the largest group of workers who were separated from employment were clerical workers of one kind or another, especially those who had been engaged in bookkeeping functions such as bookkeepers, bookkeeping machine operators, and bookkeeping clerks or who were bank, insurance, or other special industry clerks. Among data-processing occupations peripheral equipment operators were the ones most frequently laid off. The same groups also rank high when reassignments and transfers are included.

Skill Level Changes

Job shifts within establishments that resulted when EDP computer installations eliminated jobs brought about downgrading in the skill level of virtually none of the displaced workers whose services were retained by the firm. For about one-quarter the shift involved a skill-level change upward, and for the other three-quarters no change:

Skill level change	Total		Reassignments		Transfers	
	Workers	Percent	Workers	Percent	Workers	Percent
Total	6,593	-	5,036	-	1,557	-
Total reporting	4,624	100.0	3,067	100.0	1,557	100.0
To higher skill levels	1,184	25.6	1,184	38.6	-	-
To same skill levels	3,427	74.1	1,870	61.0	1,557	100.0
To lower skill levels	13	0.3	13	0.4	-	-
Total not reporting	4,761	100.0	1,969	100.0	-	-
Skill change not reported	1,969	41.6	1,969	100.0	-	-
Separated from employment	2,792	58.4	-	-	-	-

On the whole, workers with former data-processing experience were upgraded to a proportionately greater extent than workers recruited for the EDP unit from other units of the establishment. Typical of this upgraded group with data-processing experience were tabulating machine operators who were reassigned to jobs as programmers and console operators. The most usual reassignment from outside the data-processing unit was from a job such as bookkeeping machine or other office machine operator to key punch operator or data transcriber at a similar skill level. Workers whose jobs were eliminated elsewhere in the establishment were usually shifted to other duties at the same skill level.

Chapter I

INTRODUCTION

The use of electronic computers for business and scientific purposes is a comparatively recent phenomenon. The earliest installation occurred in 1954. New York State firms have been in the vanguard both in the development and manufacture of computer equipment and in pioneering their uses.

While an extensive literature on the subject of "office automation" has developed, there have been few empirical studies on the manpower effects of EDP in a broad spectrum of industries and occupations.

EDP (Electronic Data-Processing) has been defined as "pertaining to data-processing equipment that is predominantly electronic." In this study all of the electronic computers are digital, i.e., they operate on discrete data by performing arithmetic and logical processes on these data. They differ from analog computers, which process data in the form of continuously variable physical quantities. (See Appendix Table 2 for a list of EDP equipment found in the installations studied.) Prior to the development of electronic equipment, electric accounting machine equipment (EAM), which processes data by electric-mechanical methods using punch cards, was the advanced type of data-processing equipment. Typical EAM equipment includes keypunchers, sorters, collators, and tabulators. 1/

This survey deals with the following questions about the effects of electronic digital computers in offices in New York State establishments:

(1) What jobs exist in electronic data processing installations, and what were the sources from which the staff was obtained?

(2) What positions were displaced by the installation of computers, what happened to the workers who were displaced, and what was the impact of the computer technology on the skill levels of the jobs involved?

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1. See American Standards Association USA Standard Vocabulary for Information Processing, X3.12-1966, and Executive Office of the President, Bureau of the Budget, Automatic Data Processing Glossary, Washington, D.C., December 1962.

Survey Procedure

The data presented in this study were obtained through interviews with company officials by representatives of the Department of Labor during the years 1962 and 1963.

Information was obtained in two stages. As part of a schedule used in a survey of technical manpower employment in New York State, [1] the question was asked whether or not the establishment had electronic data-processing equipment and whether the services of an outside data-processing service agency were employed.

This schedule was mailed to a stratified random sample of all business and government establishments in New York State. Responses were received from 17,414 establishments, employing 50.4 percent of the total employment in all businesses in the State, exclusive of agriculture, domestic service, the military service, and the self employed who employed no other persons.

The list of establishments obtained from the responses provided a basic inventory of firms that had electronic data processing equipment in the winter of 1961-1962. The list was subsequently supplemented to a limited degree by information appearing in the trade literature.

On the basis of this canvass it is estimated that at the time 595 establishments had electronic data-processing installations in New York State State and that these establishments had approximately 900 computers. In addition it is estimated that a total of 632 establishments utilized the electronic data-processing facilities of a service agency; and that in 3,458 establishments, concentrated in trade and service industries, there was a computer installation in some other unit of the parent firm that was utilized by the reporting establishment.

Interviews in 277 of the 593 establishments that reported EDP installations constituted the second stage of the survey. Information obtained in these interviews became the basis for the findings on manpower effects of EDP which are set forth in Chapters II and III of this report.

Distribution of EDP Installations

Electronic data-processing installations were widely distributed in New York State industries during the winter of 1961-1962. Of the total, 196 were in manufacturing establishments, 137 in service industries, 123 in finance, insurance, and real estate, and 38 in government.

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[1] New York State Department of Labor, Division of Research and Statistics, Technical Manpower in New York State, Volumes I-II (1965).

Table A. NUMBER OF ESTABLISHMENTS USING ELECTRONIC DATA-PROCESSING, BY INDUSTRY GROUP, NEW YORK STATE, WINTER 1961-1962

Size of establishment	Establishments having EDP installations	Establishments utilizing outside EDP facilities		
		Total	Service agency	Electronic data-processing in other establishment of same firm
All industries	593	4,090	632	3,458
Manufacturing	196	601	86	515
Durable goods	111	215	46	169
Nondurable goods	85	386	40	346
Mining	-	11	1	10
Construction	-	47	5	42
Transportation and public utilities	33	405	62	343
Wholesale and retail trade	66	1,733	110	1,623
Finance, insurance, and real estate	123	668	146	522
Banking	44	188	34	154
Insurance	46	430	90	340
Other finance agencies	33	50	22	28
Services	137	574	198	376
Personal services	5	166	4	162
Miscellaneous business services	35	130	57	73
Educational services	25	3	3	-
Other services	72	275	134	141
Government	38	51	24	27

The largest geographic concentration of computer installations was in Manhattan, where the central offices of many major national companies are located. In other parts of the New York Metropolitan Area 94 installations were reported. Upstate there were 205 installations reported; major concentrations were in the Albany, Rochester, and Buffalo areas.

The use of EDP was closely associated with size of establishment. In the winter of 1961-1962, three of five establishments with 1,000 or more workers had computers. Of establishments with 500 to 999 workers, 18 percent had computers. The proportion of establishments with computers was much smaller in smaller establishments; in firms with 100 to 499 workers less than 4 percent had a computer, and below that level only a fraction of one percent.

More than 70 percent of the establishments using service agencies had fewer than 100 employees. However, some very large establishments supplemented their own computer resources with service agency facilities or were served by a computer located elsewhere.

Table B. NUMBER OF ESTABLISHMENTS USING ELECTRONIC DATA-PROCESSING, BY SIZE OF ESTABLISHMENT, NEW YORK STATE, WINTER 1961-1962

Size of establishment	Establishments having EDP installations	Establishments utilizing outside EDP facilities		
		Total	Service agency	Electronic data-processing in other establishment of same firm
All sizes	593	4,090	632	3,458
Less than 50 workers	78	2,989	334	2,655
50 to 99 workers	11	404	119	285
100 to 199 workers	65	261	43	218
200 to 499 workers	140	250	69	181
500 to 999 workers	93	106	44	62
1,000 to 1,999 workers	87	52	15	37
2,000 to 4,999 workers	74	24	5	19
5,000 workers or more	45	4	3	1

Characteristics of Case Study Sample

Establishments in which interviews were conducted employed a total of 527,000 workers, about half the total employment in establishments with electronic digital computers at the time of the survey. The industrial distribution of the establishments surveyed is shown in table C below.

Table C. NEW YORK STATE ESTABLISHMENTS WITH DATA-PROCESSING INSTALLATIONS IN WINTER 1961-1962 AND CASE STUDY SAMPLE, BY INDUSTRY GROUP

Industry group	Establishments having EDP installations			Case study sample		
	Number	Percent	Total employment (000's)	Number	Percent	Total employment (000's)
All industries	593	100.0	1,038.4(a)	277	100.0	527.4(a)
Manufacturing	196	33.1	382.3	94	33.9	156.9
Transportation and public utilities	33	5.6	153.8	21	7.6	91.2
Wholesale and retail trade	66	11.1	36.6	25	9.0	25.1
Finance, insurance, and real estate	123	20.7	164.0	72	26.0	108.7
Banking	44	7.4	71.2	23	8.3	50.3
Insurance	46	7.8	67.9	30	10.8	35.6
Other finance agencies	33	5.6	24.8	19	6.9	22.7
Services	137	23.1	71.3	43	15.5	25.1
Personal services	5	0.8	0.4	2	0.7	0.1
Miscellaneous business services	35	5.9	18.7	15	5.4	6.2
Educational services	25	4.2	32.5	6	2.2	12.9
Other services	72	12.1	19.7	20	7.2	5.9
Government	38	6.4	230.3	22	8.0	120.3

a. Detail may not add to total because of rounding.

A geographical distribution of the case-study establishments indicates that 64 percent were located in the New York Metropolitan area, the heaviest concentration (134 of 277 establishments) being in Manhattan. Of the 99 establishments in the case-study sample in upstate areas (36 percent of the total), 24 were in the Buffalo area, 21 in the Rochester area, and 17 in the Albany area. The remaining 27 establishments were located elsewhere in the State.

Although it cannot be demonstrated that the establishments included in the case study are entirely representative of the universe of establishments having EDP installations in the winter of 1961-1962, it is highly probable that their experience is indicative of that of the entire group in the sense they show the central or main tendencies so far as employment effects of EDP are concerned.

The present report has been prepared on the assumption, also, that the experience of the study group is suggestive of experience under installations that have occurred in more recent years, even though a vast expansion in the number of installations has taken place and there has been substantial development in the nature and application of the equipment.

The large growth in use of electronic data processing equipment for both business and scientific applications had brought the number of computers installed in New York State establishments to the neighborhood of 3,000 by the end of 1965. If the proportion of establishments with more than one computer remained the same as it was in 1962, roughly 2,400 establishments in New York State had computers at the end of 1965. By early 1969 the total number of computers installed was double the December 1965 total in the Nation as a whole. 1/

Banks, insurance companies, and stock brokerage establishments have introduced electronic data-processing at a particularly rapid pace in recent years in New York State, probably exceeding the rate of growth of installations in manufacturing industries. 2/

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1. Estimate based on number of computer units installed in the United States, as reported in Computers and Automation, "Monthly Computer Census," for the period 1962 to 1968; and by Booz, Allen & Hamilton, Inc., for earlier years, as reported in Life Office Management Association, EDP in Life Insurance, "Proceedings of an Automation Forum," 1962, p. 380.

2. Of 146 reporting commercial banks with deposits of $25 million or more in the New York Federal Reserve District, 20 had computers in operation in March 1962, 9 were installing them, and 31 were planning to install them within the next three years, according to a study made by the Federal Reserve Bank Board, reported in Federal Reserve Bulletin, November 1962, p.1417. See also, Dean, Neal J. "Impact of Automation on Bank Management," in Proceedings, The American Bankers Association National Automation Conference,1965, p.24: "Computer usage (automated demand deposit accounting) installed or in process among banks with over $500 million in deposits is estimated to have increased from 28 percent in 1960 to 92 percent in 1965. The increase for banks between $100 million to $500 million for the same period increased from roughly 8 percent to 86 percent." See also, "Office Automation in the Insurance Industry", in Monthly Labor Review, November 1965, p.1316, showing computers installed and retired in 226 insurance companies in the period 1954 to 1963.

In over 60 percent of the cases studied it was found that electromechanical data-processing equipment (EAM) was in use prior to the EDP installation (EAM equipment was first used in New York State industry in 1906) and that some of the equipment (keypunch, accounting, tabulating, collating, and sorting machines) that made up the previous installation continued to be used in a peripheral or supplementary capacity when the computer was installed.

Installations Studied

In 11 of the establishments included in the case study, sample information was obtained on two computer installations; in one establishment four separate installations were studied. 1/ In most cases there was only one installation. (Appendix table 1.)

In 209 of the 291 installations covered by the survey, there was a single computer. In the remaining installations there was more than one computer, either in parallel operation or as satellites of the central computer. (Table D.)

Table D. ESTABLISHMENTS, INSTALLATIONS, AND COMPUTERS IN THE SURVEY SAMPLE

Number of installations in establishment	Establishments	Installations	Number of computers in installation		
			Total	One computer	Two or more computers
Total	277	291	439	209	230
1 installation	265	265	419	189	210
2 or more installations	12	26	40	20	20
2 installations	11	22	35	17	18
4 installations	1	4	5	3	2

The individual computers found are listed in appendix table 2, together with the size of their data-processing work force.

In some firms with several large installations the changes occuring over the period studied--limited to five years prior to the date of the visit--were so many or complex that it was difficult to obtain data for the entire series of installations. In these cases data usually were obtained for one representative installation.

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1. An "installation" is a separately administered organizational unit in an establishment that has the responsibility for data processing and whose equipment configuration includes one or more electronic data digital computers. It includes data-processing equipment directly associated with the computer, such as high speed printers and card-to-tape converters, as well as in some units conventional electric accounting machine equipment such as tabulators and sorters.

Because during the introductory and debugging stages of a computer installation, staffing patterns may be abnormal (in that there may be a temporary enlargement of employment not reflecting the size of the final work force), information was obtained about the status of conversion to EDP at the time of the survey. The information indicated that the installations had been completed in 86 percent of the cases studied. In 9 percent of the cases the conversions were still in process and, therefore, the data obtained concerning employment related to the temporary conversion stage. In 5 percent of the cases the data related to the situation as it was expected to exist after the conversion was completed.

Almost all the installations in the survey were "complete" in the sense that the input, output, and computational facilities were to be found in the installation. However, in five installations most input preparation facilities (for example, certain airline operations) were located outside the establishment studied ("incomplete systems").

The growth in the use of computers by New York State firms is reflected in the establishments in the case study sample. Three of the computer installations, involving a total of four computers, were in use in 1955. A total of 51 installations in the surveyed establishments came into use during the four years, 1956 to 1959. In 1960, 40 of the sampled establishments installed computer systems; in the following year the number was 83. In 1962--the last full year for which data was obtained--104 of the computer systems were installed. The remaining 10 installations in the sample were made in the first half of 1963 (appendix table 3).

Computer Applications

The electronic computer has a broad area of application both in business and scientific data processing. In June 1961, a nationwide compilation showed over 500 areas of application. 1/ A more recent list classifies 1,000 different uses.2/

Of the 291 installations included in the present case studies, 230 were used in various business applications, 32 in scientific or engineering applications, and 20 in both business and scientific purposes. The remaining 9 installations were in service agencies which performed computation work for a variety of clients. The most common applications were payroll and accounts maintenance.

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1. Macdonald, Neil M. Computers and Automation, June 1961, pp. 133-137.
2. Binger, James H. "The Computer, Engine of the Eighties," Advanced Management Journal, Vol. XXII, No.1, 1967, p.26.

The following figures, based on appendix table 4, show that establishments usually had more than one use for their computer system, and that accounting was a use, or the use, in more than half of the 277 establishments reporting on the way computers were applied.

	Percent of establishments reporting
Accounting applications:	
Payroll	56.0
General ledger, accounts receivable and/or payable	54.2
Inventory control	35.7
Cost accounting	19.9
Sales analysis and market research	31.4
Production scheduling and control	20.9
Engineering design and product analysis	20.9
Purchase and sales order processing	18.4

Three of five installations included in the case studies were located in the finance or accounting department of the establishments covered. In only 9 percent was the computer located in an entirely separate data-processing department or division. (See table E, based on appendix table 5.)

Table E. ORGANIZATIONAL LOCATION OF THE ELECTRONIC DATA-PROCESSING INSTALLATION

Organizational unit	Percent of installations
Total reporting	100.0
Finance or accounting department	59.7
Research, statistics, actuarial, or engineering department	12.5
Administrative department	10.6
Data-processing division	9.2
Other organizational unit	1.0

Use of EDP Personnel on Multiple Shifts

Of the 290 installations for which work-shift information was obtained, 178, or approximately 62 percent, operated their central processing unit on one shift. About 25 percent operated them on more than one shift but less than two full shifts (i.e., full shift and a shorter night shift) or two full shifts; and 11 percent used their consoles more than two full shifts. In the remaining installations shift operation practices were unsettled.

The frequency of shift operation was associated with the size of the installation. Multiple-shift operation was found more frequently in large installations than in small ones.

The most frequent use of multiple shift operation was found in finance agencies, such as stock brokerage houses and security exchanges. Thirteen of the 19 installations in this industry group used their computers on more than one shift. Almost half the banks and insurance installations in the study sample also operated on more than one shift. Multiple-shift operations were found in almost every industry group. (Table F.)

Table F. NUMBER OF SHIFTS WORKED BY COMPUTER PERSONNEL, BY INDUSTRY GROUP

(Number of installations)

Industry group	All schedules	Number of shifts worked									
		1	1½	2	2½	3	1, 2 (a)	1, 2½ (a)	1, 2, 3 (a)	2, 3 (a)	Not reported
All industries	291	178	14	59	2	31	1	1	1	1	1
Manufacturing	100	64	1	23	2	7	3	-	-	-	-
Durable goods	60	35	1	17	2	4	1	-	-	-	-
Nondurable goods	40	29	-	6	-	3	2	-	-	-	-
Transportation and public utilities	22	11	1	5	-	5	-	-	-	-	-
Wholesale and retail trade	25	17	-	5	-	3	-	-	-	-	-
Finance, insurance and real estate	73	35	6	18	-	11	-	1	1	1	-
Banking	23	12	1	5	-	4	-	-	-	1	-
Insurance	31	17	3	6	-	4	-	-	1	-	-
Other finance agencies	19	6	2	7	-	3	-	1	-	-	-
Services	45	37	2	2	-	3	-	-	-	-	1
Personal services	2	2	-	-	-	-	-	-	-	-	-
Miscellaneous business services	16	11	1	2	-	2	-	-	-	-	-
Educational services	7	5	-	-	-	1	-	-	-	-	1
Other services	20	19	1	-	-	-	-	-	-	-	-
Government	26	14	4	6	-	2	-	-	-	-	-

a. Columns with more than one shift designation indicate that different shifts were used for different computers in installations having more than one computer.

Chapter II

THE ELECTRONIC DATA-PROCESSING WORK FORCE IN ESTABLISHMENTS USING COMPUTERS

This section of the report describes the occupational composition of the staff employed in EDP installations covered by the survey. It also indicates the sources from which the staff was obtained.

Differing management ideas concerning the organization of work in an establishment, traditional organizational relationships, company objectives in introducing a computer system, and other circumstances affect both the location of the computer unit in the organizational structure and the composition of its work force. It was necessary, therefore, to establish criteria to assure a reasonable degree of uniformity in the kind of personnel included in the electronic data processing work force.

One criterion was that a worker should devote more than half his working time to an activity directly associated with the work of the computer. For the most part the individuals excluded by this criterion were persons who devoted part (but less than half) of their time to providing input information for the EDP system. Figuring prominently among such personnel were bank proof clerks, reservation clerks in airline companies, various specialized clerks in insurance companies, statistical clerks, engineers, and statisticians. Coding clerks who enter appropriate symbols from which key punch operators prepare cards also were excluded; most establishments did not consider them to be part of the data-processing operation.

A second general criterion required that the worker be under the supervision of the director or manager of the EDP unit. There were, however, some exceptions to this rule. Systems analysts were included although they may have reported to administrative personnel outside the computer unit if their work related directly to information systems involving use of the computer. Excluded were a few positions in establishments in transition to computerization that reported to the head of the computer unit although similar positions were not found in other installations with the same equipment configuration. For the most part these were accounting clerks not yet absorbed in other units of the establishment.

Kinds of Occupation

Ten groups of electronic data processing occupations were identified. 1/ These, together with the individual occupations in each class and the number of workers in the establishments covered by the survey, are set forth in Table G.

Occupations that are uniquely associated with the computer included programmer, console operator, tape librarian, and computer equipment maintainer. An occupation that was found occasionally in electric accounting machine installations but more after in installations with computers was the systems analyst. Peripheral equipment operators cover a wide variety of machine operators, many of whom had similar jobs in the establishment prior

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1. See Appendix A for definition of occupational groups.

to the computer installation. Sorting machine operator and tabulating machine operator are representative examples. On the other hand, some peripheral equipment personnel such as high-speed printer operator and card-to-tape operator are associated primarily with computer installations.

TABLE G. OCCUPATIONS OF WORKERS IN ELECTRONIC DATA-PROCESSING INSTALLATIONS

Occupation	Number	Percent
Total workers	13,743	100.0
Director or general supervisor	617	4.5
Systems analyst	762	5.5
Supervising systems analyst	42	0.3
Supervising systems analyst and programmer	29	0.2
Systems analyst (all other grades)	429	3.1
Systems analyst and programmer	262	1.9
Programmer	1,383	10.1
Supervising programmer	61	0.4
Programmer (all other grades)	1,310	9.6
Programmer and console operator	12	0.1
Controller	425	3.1
Supervising controller or scheduler	29	0.2
Control clerk	396	2.9
Console operator	1,145	8.3
Supervising console operator	112	0.8
Console operator (all other grades)	712	5.2
Console and peripheral equipment operator	321	2.3
Peripheral equipment operator	2,297	16.7
Supervising peripheral equipment operator	209	1.5
Peripheral equipment operator	2,088	15.2
Key punch operator or data transcriber	5,965	43.4
Supervising key punch operator or data transcriber	238	1.7
Key punch operator	5,048	36.8
Data transcriber	679	4.9
Tape librarian	84	0.6
Equipment maintainer	40	0.3
Miscellaneous clerical personnel	1,025	7.5
Supervisor of clerical personnel	29	0.2
Secretary, stenographer, typist, receptionist	71	0.5
Clerk	925	6.8

Some differences in the occupational patterns of the electronic data processing work force appear among the various industry groups. These are indicated in table H.

Table H. WORKERS IN ELECTRONIC DATA-PROCESSING OCCUPATIONS BY INDUSTRY GROUP

(Percent distribution)

Industry group	Total	Occupation group							
		Director or general supervisor	Systems analyst	Programmer	Controller or scheduler	Console operator	Periferal equipment operator	Key punch operator or data transcriber	Miscellaneous personnel(a)
All industries	100.0	4.5	5.5	10.1	3.1	8.3	16.7	43.4	8.4
Manufacturing	100.0	5.1	7.5	11.4	4.4	10.5	17.4	36.3	7.4
Transportation and public utilities	100.0	4.2	6.7	8.5	3.5	7.9	13.6	51.0	4.6
Wholesale and retail trade	100.0	7.3	1.5	9.1	1.4	8.0	14.2	45.6	12.9
Finance, insurance, and real estate	100.0	4.1	4.4	9.8	3.4	8.0	16.4	43.6	10.3
Banking	100.0	4.4	5.7	5.7	7.7	8.9	9.7	47.6	10.3
Insurance	100.0	4.2	5.0	13.4	1.2	6.4	20.1	45.7	4.0
Other finance agencies	100.0	3.3	1.1	8.4	1.6	9.8	18.8	32.6	24.4
Services	100.0	5.8	6.6	14.3	0.7	9.7	21.7	34.2	7.0
Personal services	100.0	8.0	-	8.0	-	4.0	36.0	36.0	8.0
Miscellaneous business services	100.0	5.5	8.6	18.8	0.6	6.5	19.7	34.8	5.5
Educational services	100.0	8.7	1.7	15.6	-	12.2	9.6	33.9	18.3
Other services	100.0	4.7	6.9	9.1	1.1	13.0	27.9	33.3	4.0
Government	100.0	3.6	6.1	8.9	1.6	6.3	17.9	49.9	5.7

a. Includes tape librarians and equipment maintainers, as well as miscellaneous clerical personnel.

The proportion of programmers to total EDP staff was found to be relatively high in insurance companies, an industry group that pioneered in computer applications and that reported numerous new applications in the planning stage at the time of the survey. In this industry 13.4 percent of the data-processing personnel were programmers, compared with 10.1 percent in all industries. Other industries with above-average proportions of programmers included miscellaneous business service -- 18.8 percent (this industry group included data-processing service companies and educational services) and manufacturing -- 11.4 percent. Banks had a smaller ratio of programmers on their staffs than other industries -- 5.7 percent, a proportion that may be attributed to the relatively small number of applications at the time of the survey.

The proportion of systems analysts was found to be highest in manufacturing industries -- 7.5 percent of the computer work force -- and lowest in "other finance agencies" -- 1.1 percent. This latter industry group consists principally of security and commodity brokers, exchanges, and related services, where standardized "software" packages were available and the use of consultant services was common.

On the average, data input personnel, i.e., key punch operators and data transcribers, made up 43.4 percent of the EDP staff. In the transportation and public utilities industry, where customer billing was a major use, key punchers made up 51 percent of the staff.

The high incidence of clerical personnel in "other finance agencies" -- 24.4 percent -- stands out among the remaining occupational groups. For the most part these are tub file clerks, card pullers, and similar occupations whose work was connected with individual customer records but required handling by clerical workers.

Staffing the Electronic Data-Processing Installation

In staffing new EDP installations the entire staff had to be recruited either from within or outside the establishment. In conversions from previous electric accounting machine (EAM) operations, input personnel and tabulating machine operators usually were available in the existing organization; but specialized personnel, such as systems analysts, programmers, console operators, and cumputer-related peripheral equipment operators, were needed. The installation of an updated computer usually created a need for added personnel, especially in those cases in which an enlarged computer capability was to be utilized for new applications.

Such personnel were obtained from a variety of sources. Some personnel were manufacturer's representatives assigned to the installation. Some were hired from outside the firm. But the predominant source was personnel in the establishment itself. 1/

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1. Because of personnel turnover and organizational change, the individual found to be filling an electronic data-processing postion at the time of the survey may not have been the same individual as the one who originally filled the post when the equipment change took place. (Continued on next page)

Workers drawn from within the establishment were either transferred or reassigned from their former position. They were considered to be transferred if no substantial change took place in their job duties when they were either (a) shifted from one organizational unit to another or (b) employed in a data-processing unit whose character was changed in some respect by the installation of a computer. Workers were placed in the reassigned category if they were shifted to a job with substantially different duties than before, whether at a higher, a lower, or at the same skill level.

Both transferred and reassigned workers can be divided into (a) those who previously, prior to the EDP installation, had been in a data-processing unit and (b) those who had been in some other unit of the establishment. The earlier data-processing unit in some cases was an electric-accounting machine (EAM) unit that was replaced or supplemented by an electronic computer installation. In other cases it was an EDP unit that was updated by the installation of new model computers or supplemented by additional computers of the same type as the existing ones.

Almost half the workers were transferred, having been in jobs similar to those held at the time of the survey. The predominant change that took place was a change in the work environment -- from one kind of data-processing unit to another -- with the worker's essential day-to-day tasks remaining the same.

Approximately 27 percent of the workers were reassigned, a shift that involved a substantial change in job duties (table I, on p. 25). Half (51 percent) of the workers in this group for whom previous position was reported were reassigned to the computer unit from jobs in the previous data-processing unit -- largely because staffing changes required by the new equipment configuration eliminated the need for the kinds of work they had performed previously. The remaining 49 percent were reassigned to jobs in an EDP unit from positions elsewhere in the establishment.

About a quarter of the workers employed in the computer unit were hired for their jobs, having had no previous work experience in the particular establishment. A few workers were stationed at the establishment by the equipment supplier to assist in the proper operation of the installation.

The open market as a source of workers was most important for the programmer occupation group -- three out of eight workers in this group were newly hired, in all installations combined. The open market was least important for peripheral equipment operators; only one in six came from this source. For console operators, it was one in five; two-thirds of the workers in this group were reassigned from previous jobs in the same establishment. Table J shows the source of workers in each occupation and occupation group.

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1. (continued from previous page) The previous occupation of the present incumbent, therefore, may differ from that of others who had filled the position earlier. The data presented in this section of the report do not reflect these intermediate changes. The reporting was limited to identifying the position the present incumbent held immediately preceding the equipment installation or change. If the incumbent had not been with the firm at the time of the computer installation or change he was put in the "newly hired" category.

Table I. SOURCE OF WORKERS IN ELECTRONIC DATA-PROCESSING POSITIONS BY RELATION TO FORMER EQUIPMENT

Source of workers	Total	New data-processing installation	Addition to or replacement of EAM installation	Updated computer
Installations	291	41	71	179
		Number of workers		
Total workers	13,743	1,366	7,291	5,086
Transferred	6,679	28	3,815	2,836
From positions in a data-processing unit	6,614	19	3,783	2,812
From other positions in establishment	65	9	32	24
Reassigned	3,721	703	2,184	834
From positions in a data-processing unit	1,659	-	1,277	382
From positions elsewhere in establishment	1,587	703	617	267
From positions whose location was not reported	475	-	290	185
Newly hired	3,313	630	1,283	1,400
Employees of equipment supplier	30	5	9	16
		Percent of workers		
Total workers	100.0	100.0	100.0	100.0
Transferred	48.6	2.0	52.3	55.8
From positions in a data-processing unit	48.1	1.4	51.9	55.3
From other positions in establishment	0.5	0.6	0.4	0.5
Reassigned	27.1	51.5	30.0	16.4
From positions in a data-processing unit	12.1	-	17.5	7.5
From positions elsewhere in establishment	11.5	51.5	8.5	5.3
From positions whose location was not reported	3.5	-	4.0	3.6
Newly hired	24.1	46.1	17.6	27.5
Employees of equipment supplier	0.2	0.4	0.1	0.3

Table J. OCCUPATIONS OF WORKERS IN ELECTRONIC DATA-PROCESSING INSTALLATIONS, BY SOURCE FROM WHICH OBTAINED

Present occupation	Total	Source from which obtained					
		Newly hired or manufacturer's representative	Transferred		Reassigned		
			From positions in a data-processing unit	From positions elsewhere in the establishment	From positions in a data processing unit	From positions elsewhere in the establishment	From positions whose location not reported
Total workers	13,743	3,343(a)	6,614	65	1,659	1,587	475
Director or general supervisor	617	78	93	1	276	115	54
Systems analyst	762	171	201	1	122	180	87
Supervising systems analyst	42	10	8	-	9	10	5
Supervising systems analyst and programmer	29	5	7	1	2	13	1
Systems analyst (all other grades)	429	107	92	-	81	102	47
Systems analyst and programmer	262	49	94	-	30	55	34
Programmer	1,383	519	182	20	278	307	77
Supervising programmer	61	22	5	-	11	14	9
Programmer (all other grades)	1,310	495	175	20	264	288	68
Programmer and console operator	12	2	2	-	3	5	-

Continued

Table J (continued)

Present occupation	Total	Source from which obtained					
		Newly hired or manufacturer's representative	Transferred		Reassigned		
			From positions in a data-processing unit	From positions elsewhere in the establishment	From positions in a data-processing unit	From positions elsewhere in the establishment	From positions whose location not reported
Controller or scheduler	425	83	178	12	20	104	28
Supervising controller or scheduler	29	2	12	4	2	6	3
Control clerk	396	81	166	8	18	98	25
Console operator	1,145	232	130	-	631	103	49
Supervising console operator	112	16	16	-	63	8	9
Console operator (all other grades)	712	175	65	-	347	88	37
Console and peripheral equipment operator	321	41	49	-	221	7	3
Peripheral equipment operator	2,297	384	1,626	1	141	112	33
Supervising peripheral equipment operator	209	18	146	-	34	8	3
Peripheral equipment operator	2,088	366	1,480	1	107	104	30
Key punch operator	5,965	1,571	3,651	1	116	549	77
Supervising key punch operator or data transcriber	238	24	123	1	27	50	13
Key punch operator	5,048	1,307	3,478	-	46	170	47
Data transcriber	679	240	50	-	43	329	17

Continued

Table J (concluded)

Present occupation	Total	Source from which obtained					
		Newly hired or manufacturer's representative	Transferred		Reassigned		
			From positions in a data-processing unit	From positions elsewhere in the establishment	From positions in a data-processing unit	From positions elsewhere in the establishment	From positions whose location not reported
Tape librarian	84	16	5	-	32	17	14
Equipment maintainer	40	25	12	-	2	1	-
Miscellaneous clerical personnel	1,025	264	536	29	41	99	56
Supervisor or clerical personnel	29	1	25	-	1	2	-
Secretary, stenographer, typist, receptionist	71	27	31	10	-	1	2
Clerk	925	236	480	19	40	96	54

a. Includes 30 employees of equipment supplier.

The importance of the various sources of computer-unit staff differed according to whether the transition to computer equipment was from hand or bookkeeping machine-type record keeping, electric accounting unit record equipment (EAM), or previous EDP computer equipment.

In the first group, computers were installed to take the place of manual data handling, including the use of keyboard-operated bookkeeping machines and desk calculators. In these cases the computer installation was designated as a "new data-processing installation," a shorthand way of saying that the establishment had no unit-record or electronic equipment in use at the time the computer was installed.

In the second group computers were installed as substitutes for or as supplements to electro-mechanical accounting machine equipment (EAM). These installations are described as "addition to or replacement of EAM installation."

A third group consisted of installations in which a new generation computer replaced an older model, e.g., an IBM 1401 central processor was installed to replace the older IBM 650. This group also includes computers that were installed simply as an addition to the total equipment configuration already in place--for example, an additional IBM 1401 central processor was added to an existing IBM 1401 installation. Both of these types of installation were designated as "updated computer."

The table below gives the number of installations in each of the three categories and the number of electronic data-processing workers employed in them. (See also appendix table 6-A.)

Table K. WORKERS IN ELECTRONIC DATA-PROCESSING INSTALLATIONS IN RELATION TO FORMER EQUIPMENT

Relation to previous equipment	Number		Percent	
	Installations	Workers	Installations	Workers
Total	291	13,743	100.0	100.0
New data-processing installation	41	1,366	14.1	9.9
Addition to or replacement of EAM installation	71	7,291	24.4	53.1
Updated computer	179	5,086	61.5	37.0

Sources of workers in new electronic data-processing installations

Of the 1,366 workers found employed in new data-processing installations, 703 (52 percent) were reassigned from previous jobs in the establishment, 635 were new employees (46 percent), and 28 (2 percent) were transferred to the data-processing unit without substantial change in duties.

(a) The reassigned workers and their jobs.

Information was available on the previous occupation of 573 of the reassigned workers. It is summarized in table L (based on table 6-B).

Table L. PRESENT OCCUPATIONS OF REASSIGNED PERSONNEL IN NEW INSTALLATIONS BY SELECTED PRIOR OCCUPATIONS

(Percent distribution)

Present occupation (includes all skill levels)	Total reporting		Prior occupation				
	Number	Percent	Administrative and managerial	Accountant, engineer or other professional	Bookkeeping machine operator	Supervisor of clerical occupations	Other clerical occupations
Total	573	100	6	11	59	4	20
Director or general supervisor	41	100	15	24	-	54	7
Systems analyst	35	100	20	51	6	-	23
Programmer	67	100	34	46	-	-	20
Controller or scheduler	47	100	-	-	81	-	19
Console operator	39	100	-	8	13	-	79
Peripheral equipment operator	44	100	-	-	50	-	50
Key punch operator or data transcriber	284	100	-	-	90	-	10
Other occupation	16	100	-	-	100	-	-

Electronic data-processing administrators and general supervisors were recruited from within the establishment from among those who had previously supervised clerical operations (54 percent) but also from among professional staff such as accountants and engineers (24 percent), from among administrative and other personnel (15 percent), and from clerical personnel (7 percent.)

About half the systems analysts, some of whom in smaller installations also did programming, were recruited from among accounting, engineering, or other professional staffs. Twenty percent were reassigned from the ranks of administrators or managers. The remaining systems analysts were recruited from among clerks with specialized experience and former bookkeeping machine operators.

Most programmers had formerly held administrative or professional posts. About 20 percent had been in clerical jobs.

Most reassigned console operators employed in the new installations had been in clerical positions. A few were bookkeeping machine operators, and a still smaller number had had junior professional jobs. Half the peripheral equipment operators were recruited from among displaced bookkeeping machine operators. The remaining operators had been clerks.

Ninety percent of the keypunch operators and data transcribers were recruited from among former bookkeeping machine operators. This large proportion in the sample is heavily weighted by the experience of a large banking establishment. The other keypunch operators had been clerks or typists.

(b) Newly hired workers

Approximately 46 percent of the employees hired from outside the firm in establishments with newly installed computers were in data input occupations, i.e., key punch operators and data transcribers (including supervisors). Console and peripheral equipment operators (including supervisors) made up 23 percent of the new workers hired. Clerical and secretarial support personnel were 13 percent of the new employee total. Approximately 10 percent were systems analysts and programmers. The remaining eight percent were administrative personnel, control clerks, and a few tape librarians and equipment maintainers.

(c) Transferred workers

The transfer process was not an important method of obtaining workers for the data-processing unit in new installations. A few secretarial and clerical workers were shifted.

Sources of workers in updated EAM installations

More than half of the data-processing staff (52 percent) in establishments that added a computer to or substituted one for their previous EAM unit-record equipment were already in jobs like the ones they held in the improved or expanded data-processing unit. Thirty percent of the workers in these installations had been reassigned, the vast majority from jobs in a prior data-processing unit. Approximately 18 percent of the workers in data-processing occupations had been newly hired. (See table M.)

Table M. OCCUPATIONS OF WORKERS BY SOURCE FROM WHICH OBTAINED ADDITION TO OR REPLACEMENT OF EAM INSTALLATION

Present occupation	Total	Newly hired (a)	Transferred		Reassigned		
			From positions in a data processing unit	From positions elsewhere in the establishment	From positions in a data processing unit	From positions elsewhere in the establishment	From positions whose location not reported
Total workers	7,291	1,292	3,783	32	1,277	617	290
Director or general supervisor	385	38	19	-	257	42	29
Systems analyst	394	103	37	-	98	105	51
Supervising systems analyst	25	5	-	-	8	10	2
Supervising systems analyst and programmer	15	5	1	-	1	7	1
Systems analyst (all other grades)	204	59	14	-	66	51	14
Systems analyst and programmer	150	34	22	-	23	37	34
Programmer	703	243	8	-	206	195	51
Supervising programmer	31	11	-	-	6	5	9
Programmer (all other grades)	666	232	8	-	198	186	42
Programmer and console operator	6	-	-	-	2	4	-
Controller or scheduler	190	19	98	12	17	21	23
Supervising controller scheduler	15	1	5	4	-	2	3
Control clerk	175	18	93	8	17	19	20
Console operator	679	111	-	-	499	34	35
Supervising console operator	67	7	-	-	53	1	6
Console operator (all other grades)	364	82	-	-	229	27	26
Console and peripheral equipment operator	248	22	-	-	217	6	3

Continued

Table M (concluded)

Present occupation	Total	Newly hired	Transferred		Reassigned		
			From positions in a data processing unit	From positions elsewhere in the establishment	From positions in a data processing unit	From positions elsewhere in the establishment	From positions whose location not reported
Peripheral equipment operator	1,435	197	1,114	-	69	30	25
Supervising peripheral equipment operator	140	9	103	-	25	-	3
Peripheral equipment operator	1,295	188	1,011	-	44	30	22
Key punch operator or data transcriber	2,949	481	2,210	-	66	137	55
Supervising keypunch operator or data transcriber	105	7	76	-	11	1	10
Keypunch operator	2,723	459	2,107	-	12	117	28
Data transcriber	121	15	27	-	43	19	17
Tape librarian	53	9	-	-	24	10	10
Equipment maintainer	30	17	11	-	2	-	-
Miscellaneous clerical personnel	473	74	286	20	39	43	11
Supervisor or clerical personnel	13	-	13	-	-	-	-
Secretary, stenographer, typist, receptionist	32	9	16	6	-	-	1
Clerk	428	65	257	14	39	43	10

a. Includes manufacturer's representatives.

Based on appendix table 6-C.

(a) Reassigned workers

Information was available on the jobs held before the computer was installed for 1,894 of the 2,184 reassigned workers in the surveyed establishments.

Prior location	Total
Total reassigned	2,184
Total reporting prior location	1,894
Position in data-processing unit	1,277
Position elsewhere in establishment	617
Not reporting location	290

Approximately two-thirds (67 percent) of the reassigned workers found employed in the data-processing unit had previously had some kind of data-processing jobs and were moved to new jobs within the unit. About one-third were recruited from other organizational units in the establishment.

As might be expected, managerial and supervisory personnel were drawn from those who had similar responsibilities in the electric accounting machine installation -- 71 percent of the managerial and supervisory personnel had this background. (See table N, based on table 6-C.)

Two-thirds of the systems analysts were recruited from among the professional personnel of the firm including such occupations as accountants, engineers, statisticians, etc. The others were, for the most part, upgraded from related methods and procedures and analyst jobs.

The programming staff was drawn in about equal proportions from previous EAM unit personnel and from other units in the establishment. The largest single source for programmer (all grades) was peripheral equipment operator. Forty-two percent of the programmers had previously been peripheral equipment operators, mainly EAM tabulating machine operators; 30 percent had been clerks; 14 percent had been employed in professional occupations; the remaining 14 percent were individuals who had previously been in administrative or supervisory positions, or in lower-level methods-analysis jobs.

More than nine of ten console operators had previously been peripheral (mostly EAM tabulating) equipment operators. Almost all the others had been in clerical occupations.

Table N. PRESENT OCCUPATIONS OF REASSIGNED PERSONNEL BY SELECTED PRIOR OCCUPATIONS ADDITION TO OR REPLACEMENT OF EAM INSTALLATION

(Percent distribution)

Present occupation (includes all skill levels)	Total reporting		Prior occupation								
			Data-processing occupation					Nondata-processing occupation			
	Number	Percent	Administrative and managerial	Systems analyst	Peripheral equipment operator	Keypunch operator	Other occupations	Administrative and managerial	Accountant, engineer, or other professional	Clerk (all classes incl. supervisors)	Other nondata processing occupations
Total	1,894	100	12	6	43	4	3	3	7	22	(a)
Director or general supervisor	299	100	71	4	8	-	3	7	5	1	1
Systems analyst	203	100	3	34	11	-	-	7	32	13	-
Programmer	401	100	3	5	42	1	(a)	5	14	30	-
Controller or scheduler	38	100	-	-	13	18	13	3	3	50	-
Console operator	533	100	1	(a)	93	(a)	-	(a)	(a)	5	1
Peripheral equipment operator	99	100	3	-	55	2	10	-	-	30	-
Keypunch operator or data-transcriber	203	100	-	-	3	27	3	-	-	67	-
Tape librarian	34	100	-	-	56	9	6	-	-	29	-
Equipment maintainer	2	100	-	-	-	-	100	-	-	-	-
Miscellaneous clerical	82	100	-	-	17	7	23	-	-	53	-

a. Less than 0.5 of a percent.
Based on appendix table 6C.

More than two-thirds (68 percent) of the keypunching and data transcriber staff who had been reassigned to new jobs were formerly clerical workers, including bank clerks and bookkeeping and other office machine operators. The others had had lower level keypunching jobs, a few apparently downgraded from peripheral equipment operator.

(b) Newly hired workers

As was shown above in Table M, 18 percent of the data-processing staff employed in installations in which a newly installed computer supplanted or supplemented previous EAM equipment were new employees. Three of eight of the new workers were keypunchers or data transcribers. The second largest group of workers for whom employers had to go to the open market were programmers (19 percent of the total). A substantial proportion (15 percent of the new employees) were peripheral equipment operators. The remaining new workers were scattered among other data-processing occupations and included console operators, systems analysts, managers, and other occupations (8 percent).

(c) Transferred workers

Because of the common elements in the new and the old installation, more than half of the workers in the new installation units remained at essentially the same jobs that they had had. Of the workers shifted to the newly constituted unit from the previous EAM unit, nearly 60 percent were keypunch operators or data transcribers, while nearly 30 percent were peripheral equipment operators. The largest occupational group among the remaining transferred workers were clerks (7 percent of the total).

Very few workers (less than 1 percent of the staff in converted EAM installations) were transferred from positions that were not directly affected by the computer installation. Most of those thus shifted were general clerical and stenographic personnel whose experience could be utilized in the data-processing unit.

Sources of workers in updated computer installations

In installations in which EDP computer capacity was increased, either through the acquisition of an additional computer or the substitution of more advanced equipment for older models, the average firm found it necessary to hire additional workers to a substantially greater extent than was typical in installations in which the computer was added to a previous EAM unit-record system. In updated computer installations 28 percent of the workers were "newly hired workers," a higher proportion than in converted EAM installations. Reassignments, on the other hand, were relatively less frequent. (See table O and appendix table 6-D.)

Table O. OCCUPATIONS OF WORKERS BY SOURCE FROM WHICH OBTAINED UPDATED COMPUTER INSTALLATION

Present occupation	Total	Newly hired	Transferred		Reassigned		
			From EDP(a)	Other (b)	From EDP(a)	Other (b)	Not reported
All occupations	5,086	1,416	2,812	24	382	267	185
Director or general supervisor	154	16	74	1	19	19	25
Systems analyst	314	56	160	1	24	37	36
Supervising systems analyst	17	5	8	-	1	-	3
Supervising systems analyst and programmer	14	-	6	1	1	6	-
Systems analyst (all other grades)	196	45	74	-	15	29	33
Systems analyst and programmer	87	6	72	-	7	2	-
Programmer	540	227	174	20	72	21	26
Supervising programmer	19	8	5	-	5	1	-
Programmer (all other grades)	517	219	167	20	66	19	26
Programmer and console operator	4	-	2	-	1	1	-
Controller or scheduler	163	41	80	-	3	34	5
Supervising controller or scheduler	13	1	7	-	2	3	-
Control clerk	150	40	73	-	1	31	5
Console operator	346	57	120	-	132	23	14
Supervising console operator	37	2	16	-	10	6	3
Console operator (all other grades)	249	48	55	-	118	17	11
Console and peripheral equipment operator	60	7	49	-	4	-	-
Peripheral equipment operator	716	106	512	1	72	17	8
Supervising peripheral equipment operator	61	7	43	-	9	2	-
Peripheral equipment operator	655	99	469	1	63	15	8
Key punch operator or data transcriber	2,394	799	1,436	1	50	86	22
Supervising key punch operator or data transcriber	86	8	47	1	16	11	3
Key punch operator	2,128	696	1,366	-	34	13	19
Data transcriber	180	95	23	-	-	62	-
Tape librarian	22	4	5	-	8	1	4
Equipment maintainer	6	4	1	-	-	1	-
Miscellaneous clerical personnel	431	106	250	-	2	28	45
Supervisor of clerical personnel	14	1	12	-	1	-	-
Secretary, stenographer, typist, receptionist	24	7	15	-	-	1	1
Clerk	393	98	223	-	1	27	44

a. From positions in a data-processing unit.
b. From positions elsewhere in the establishment.

Based on appendix table 6-D.

These differences are related to whether the computer improvement was intended to expand or improve prior functions or to extend the use of the computer to new areas of application. The latter tended to displace workers to a greater extent than the former. Exhaustion of the supply of workers within the establishment with the requisite aptitude for data-processing work also was a factor contributing to the smaller proportion of reassignments in updated computer installations.

(a) Reassigned workers.

Of the 834 reassigned workers in the sampled firms that updated their computer installation, information on previous occupation was available for 649 workers. Of the reporting group, about 60 percent were previously employed in the data-processing unit and were either upgraded or shifted to new responsibilities. The remaining 40 percent were recruited from other units of the establishment. (See appendix table 6-D for further detail.)

Prior location	Total
Total reassigned	834
Total reporting prior location	649
Position in data-processing unit	382
Position elsewhere in establishment	267
Not reporting location	185

As may be seen in table P, additional administrative and managerial personnel were obtained in about equal proportions through reassignment of those in the data-processing unit and of persons in other units of the establishment. Most of the reassigned administrative personnel had administrative responsibility in their previous jobs which was enlarged when they were reassigned to their new jobs. Others were selected from among peripheral equipment operators and professional personnel.

Twice as many systems analysts were reassigned from other positions in the establishment as from the data-processing unit. These other positions included administrative and supervisory jobs, bank teller, and other clerical occupations. Of those reassigned within the data-processing unit, most were upgraded analysts or peripheral equipment operators.

Table P. PRESENT OCCUPATIONS OF REASSIGNED PERSONNEL BY SELECTED PRIOR OCCUPATIONS

UPDATED COMPUTER INSTALLATION

Present occupation (includes all skill levels)	Total number	Percent distribution by prior occupation											
			Data-processing occupation							Non-data-processing occupation			
		Total Percent	Administrative and managerial	Systems analyst	Programmer	Console operator	Peripheral equipment operator	Keypunch operator	Other data-processing occupations	Administrative and managerial	Professional (a)	Bookkeeping (b)	Other clerical (c)
All occupations	649	100	1	3	1	3	42	8	(d)	7	3	6	26
Director or general supervisor	38	100	18	5	5	5	16	-	-	40	11	-	-
Systems analyst	61	100	3	20	2	-	15	-	-	20	5	3	32
Programmer	93	100	-	4	6	8	59	-	-	1	9	2	11
Controller or scheduler	37	100	-	-	-	-	8	-	-	8	-	49	35
Console operator	155	100	-	-	-	5	77	1	1	1	(d)	1	12
Peripheral equipment operator	89	100	-	-	-	-	80	1	-	2	-	17	-
Key punch operator or data transcriber	136	100	-	-	-	(d)	(d)	35	(d)	7	-	10	47
Tape librarian	9	100	-	-	-	11	67	-	11	-	-	-	11
Equipment maintainer	1	100	-	-	-	-	-	-	-	-	-	-	100
Miscellaneous clerical	30	100	-	-	-	-	-	-	7	-	-	-	93

a. Accountant, engineer, or other professional.

b. Bookkeeper, bookkeeping machine operator, or office machine operator.

c. All classes of non-data-processing clerical worker, including supervisors.

d. Less than 0.5 of a percent.

Based on appendix table 6-D.

Three out of five reassigned programmers were formerly tabulating and other peripheral equipment operators. Other programmers were reassigned from such jobs as console operator, bank teller, bank clerk, engineer, systems analyst and a variety of other jobs.

The great majority (73 percent) of reassigned console operators had been tabulating machine operators and other peripheral equipment operators.

Fifty-eight percent of the reassigned keypunch personnel were formerly typists, office machine operators, or other clerical workers. Virtually all other reassigned keypunch personnel were upgraded in title to positions at a higher level involving substantially greater responsibility.

(b) Newly hired workers

Expansion or improvement of the computer installation was accompanied by outside hiring of additional keypunch and data transcriber personnel. Of the 1,416 workers who had not been in the establishment when the computer updating took place, 56 percent were input personnel, for the most part keypunchers. Other new workers included peripheral equipment operators, programmers, and support personnel, mostly clerks. Console operators constituted the bulk of the remaining new workers hired.

(c) Transferred workers

Fifty-six percent of the workers in the updated computer installations in the survey had been in the same occupation with substantially the same duties before the change in the installation configuration took place.

Training and Retraining

In preparing newly hired and reassigned employees for their jobs in the EDP unit, about 90 percent of the employers utilized formal training (defined as any prearranged program organized or utilized by the employer in which a course of instruction and/or on-the-job training is carried out in the establishment and/or in a school).

In slightly more than half of these establishments the formal training was provided entirely by the equipment supplier; in 31 percent of the establishments both the equipment supplier's formal training facilities and those of the establishment were utilized; in the remaining 18 percent the formal training was conducted by the establishment.

The training referred to here relates to the period of transition to the use of the new equipment. Many workers had received training in connection with a previous installation. Some firms reported that it was their policy to provide a periodic training exposure for administrative and supervisory personnel so that they could keep abreast of new developments.

The present analysis includes the formal training both of newly hired and of reassigned workers to meet the manning requirements of the new or modified data-processing installation. It omits the instances in which training was reported for workers transferred into the data-processing unit without substantial change in job content. Such training was of short duration and mainly designed to give the workers an orientation in the kind of work done by the new unit. It also omits the few cases of training given in connection with reassignments of workers from jobs displaced by EDP to jobs in the establishment outside the data-processing unit.

Occupations for which training or retraining was provided

In the sampled firms 1,984 reassigned workers, 53 percent of the reassigned workers employed in computer units at the time of the survey, received formal training that was associated with job shifts related to the acquisition of new or additional EDP equipment. In addition, 622 workers, or about 19 percent of the newly hired employees, received formal training after they were hired.

A detailed analysis of the occupation shifts of reassigned workers who were provided with formal training to help equip them for their new jobs is presented in appendix table 8. It shows that most of the training occurred in connection with occupational shifts within the data-processing organization. Approximately two-thirds of these reassigned workers had previous experience in some aspect of data-processing:

Occupation group for which training was provided	Percent with previous data-processing experience
Total	65.5
Director or general supervisor	73.9
Systems analyst	55.6
Programmer	56.8
Console operator	86.8
Other occupation groups	41.3

For the most part these workers received training for additional responsibility or higher rank in their previous occupation group. Former directors or managers of EAM units, for example, received training in connection with their new responsibilities as administrators of EDP units; systems analysts were trained for higher grade positions as well as in programming techniques required by the new equipment.

Table Q shows the number of reassigned and newly hired workers currently employed and the number and proportion of workers who received formal training. (See appendix table 7 for further detail.)

Table Q. REASSIGNED AND NEWLY HIRED WORKERS TRAINED, BY OCCUPATION FOR WHICH TRAINING WAS PROVIDED

Occupation group	Total workers			Reassigned workers			Newly hired workers		
	In EDP unit	Formal training provided	Per-cent	In EDP unit	Formal training provided	Per-cent	In EDP unit	Formal training provided	Per-cent
Total	7,064	2,606	36.9	3,721	1,984	53.3	3,343	622	18.6
Director or general supervisor	523	267	51.1	445	246	55.3	78	21	26.9
Systems analyst	560	427	76.3	389	350	90.0	171	77	45.0
Programmer	1,181	953	80.7	662	657	99.2	519	296	57.0
Console operator	1,015	595	58.6	783	546	69.7	232	49	21.1
Peripheral equipment operator	670	87	13.0	286	68	23.8	384	19	49.5
Key punch operator or data transcriber	2,313	256	11.1	742	99	13.3	1,571	157	10.0
Other occupation	802	21	2.6	414	18	4.3	388	3	0.8

Based on appendix table 7.

Programmers followed a somewhat different pattern. Only 15 percent of the reassigned programmers receiving training had been doing that kind of work. Thirty-six percent had been peripheral equipment operators. Seven percent had been in other data-processing jobs. Forty-two percent were scattered among a large number of professional and clerical occupations. These workers had not been employed previously in the data-processing unit.

Approximately 63 percent of the workers for whom training information was obtained were employed in installations in which the new equipment replaced electric accounting machine (EAM) equipment; about one-quarter (26 percent) were in updated computer installations; and 11 percent were in new installations. (See appendix table 9 for further details.)

Methods of selecting trainees

A variety of methods was used to select, from among eligible employees, those who would be reassigned and trained for jobs in the computer unit. Table R summarizes the data for related occupations. Aptitude and other testing procedures were the most requently used method of selecting workers for jobs as systems analysts and programmers. Console operators were more often selected on the basis of their previous experience and work records in the establishment. Previous experience and personnel interviews, to appraise personal qualifications were also important screening devices.

Table R. METHOD OF SELECTING TRAINEES FOR SELECTED ELECTRONIC DATA-PROCESSING OCCUPATIONS

Selection method	Occupation for which training was provided				
	Systems analyst	Systems analyst and programmer	Programmer	Console operator	Console and peripheral equipment operator
Installations reporting	55	43	169	104	24
	Number of times given method was mentioned (a)				
Testing procedures	42	29	132	59	8
Previous experience	32	31	109	87	19
Review of education and background	7	8	18	7	4
Appraisal of personal qualifications	18	12	48	24	8

a. Some installations reported more than one method of selecting trainees.

Most establishments did not mention any particular difficulties in recruiting trainees. The few that did reported that managerial freedom to select employees for data-processing training had been limited by employee resistance to change, especially in cases involving shifts in location of employment, by union security rules, by the unwillingness of other company units to release key employees who had the required aptitude, and by employee perceptions of the comparative levels of authority and responsibility in their present jobs compared with the ones that they were offered.

Duration of training

Most formal training courses were of short duration. The average training course lasted less than a month. Even in highly specialized areas such as systems analysis and programming, few workers received as much as two months of formal training, and this training often included a one-week orientation or "basics" course. (See Table S.)

Most formal courses for programming and console and peripheral equipment operation were given by the manufacturers of the equipment. A few large establishments, particularly banks and insurance companies, however, conducted their own training courses.

Information on duration of training is available for 2,269 of the 2,606 reassigned and new workers who received formal occupational training.

The formal training provided was superimposed on a variety of backgrounds and previous experience. In the case of systems analysts and programmers especially, it was primarily designed to cover the basic tools of the trade--a platform on which to build on-the-job experience. In some cases the instruction was intended only to provide employees with information about the characteristics of the newly acquired equipment.

The short duration of formal training provided in connection with the equipment change does not represent the total training that an individual may have had or the amount needed to qualify for the position. Almost without exception it was followed, and sometimes preceded, by informal on-the-job instruction.

Average duration of training was somewhat more than three weeks. Training courses for machine operator jobs, including console operator and peripheral equipment operator and keypunch operator, usually were of approximately two-weeks duration, although some console and peripheral equipment operators received as much as six weeks of formal instruction.

Table S. DURATION OF FORMAL TRAINING OF REASSIGNED AND NEWLY HIRED PERSONNEL BY OCCUPATION FOR WHICH TRAINING WAS PROVIDED

Occupation for which training was provided	Total workers	Total reporting duration of training	Duration of training: Less than 1 week	Duration of training: 1 or 2 weeks	Duration of training: 3 or 4 weeks	Duration of training: 5 or 6 weeks	Duration of training: 7 or 8 weeks	Duration of training: More than 8 weeks	Duration of training not reported
Total	2,606	2,269	102	836	672	483	138	38	337
Director or general supervisor	267	213	1	71	88	35	13	5	54
Systems analyst	427	386	-	70	157	111	45	3	41
Supervising systems analyst	21	14	-	2	7	1	4	-	7
Supervising systems analyst and programmer	14	14	-	3	5	-	6	-	-
Systems analyst (all other grades)	240	206	-	32	88	61	24	1	34
Systems analyst and programmer	152	152	-	33	57	49	11	2	-
Programmer	953	895	-	204	321	269	76	25	58
Supervising programmer	39	37	-	12	11	9	4	1	2
Programmer (all other grades)	908	852	-	190	306	260	72	24	56
Programmer and console operator	6	6	-	2	4	-	-	-	-
Controller or scheduler	1	1	-	1	-	-	-	-	-
Supervising controller or scheduler	-	-	-	-	-	-	-	-	-
Control clerk	1	1	-	1	-	-	-	-	-
Console operator	595	487	89	233	100	60	4	1	108
Supervising console operator	62	55	9	32	14	-	-	-	7
Console operator (all other grades)	424	323	62	113	83	60	4	1	101
Console and peripheral equipment operator	109	109	18	88	3	-	-	-	-
Peripheral equipment operator	87	50	-	36	6	8	-	-	37
Supervising peripheral equipment operator	8	7	-	4	-	3	-	-	1
Peripheral equipment operator	79	43	-	32	6	5	-	-	36
Key punch operator or data transcriber	256	223	11	212	-	-	-	-	33
Supervising key punch operator or data transcriber	1	1	-	1	-	-	-	-	-

Continued

Table S (concluded)

Occupation for which training was provided	Total workers	Total reporting duration of training	Duration of training: Less than 1 week	1 or 2 weeks	3 or 4 weeks	5 or 6 weeks	7 or 8 weeks	More than 8 weeks	Duration of training not reported
Key punch operator or data transcriber (continued)									
Key punch operator	234	211	-	211	-	-	-	-	23
Data transcriber	21	11	11	-	-	-	-	-	10
Tape librarian	12	10	1	9	-	-	-	-	2
Equipment maintainer	7	4	-	-	-	-	-	4	3
Miscellaneous clerical personnel	1	-	-	-	-	-	-	-	1
Supervisor of clerical personnel	-	-	-	-	-	-	-	-	-
Secretary, stenographer, typist, receptionist	-	-	-	-	-	-	-	-	-
Clerk	1	-	-	-	-	-	-	-	1

The professional group of managers, systems analysts, and programmers typically received three or four weeks of formal instruction; approximately two-fifths of the programmers and systems analysts received more.

A majority of the individuals who were reassigned were trained for jobs with a higher skill level than the ones they had had previously (table T.) However, approximately 40 percent of the workers received training even though the skill level of their new jobs was no higher than that of their former job. In these cases the new job required a body of specialized knowlege different from that previously needed. For example, professional workers such as accountants, statisticians, and technicians who were reassigned as programmers after a period of training may not have moved to jobs requiring a higher degree of skill although the skills that were needed were different than the ones used before.

TABLE T. SKILL LEVEL CHANGE OF REASSIGNED WORKERS RECEIVING FORMAL TRAINING BY DURATION OF TRAINING

Duration of training	Total	Total reporting skill level change	Skill level for which trained			Not reporting skill level change
			Higher level	Same level	Lower level	
Total	1,984	1,843	1,110	731	2	141
Total reporting	1,699	1,588	943	644	1	111
Less than 1 week	88	88	74	14	-	-
1 or 2 weeks	585	560	309	251	-	25
3 or 4 weeks	505	482	259	222	1	23
5 or 6 weeks	383	349	243	106	-	34
7 or 8 weeks	113	85	43	42	-	28
More than 8 weeks	25	24	15	9	-	1
Not reporting	285	255	167	87	1	30

Of particular interest are the 1,110 individuals in the establishments surveyed whose reassignments represented a substantial upgrading of job content. Details for 943 of the 1,110 upgraded reassigned workers are given in Appendix Table 10. The largest was a group of 561 former peripheral equipment operators. Duration of formal training for this group is shown in Table U. For this experienced group of EAM machine operators formal training for console operation was typically of two weeks duration. About one in five, however, received 5 or 6 weeks of formal training. Longer training periods were required to introduce them to nonmachine work such as programming and systems analysis.

TABLE U. DURATION OF TRAINING FOR UPGRADED PERIPHERAL EQUIPMENT OPERATORS

(Percent distribution)

Occupation for which training was provided	Total reported		Duration of training			
	Number	Percent	2 weeks or less	3 or 4 weeks	5 or 6 weeks	7 weeks or more
Total reported	561	100	48	26	22	4
Director or general supervisor	10	100	-	70	30	-
Systems analyst (all grades)	22	100	18	64	18	-
Programmer (all grades)	201	100	26	33	30	11
Supervising console operator	36	100	72	28	-	-
Console operator (all other grades)	292	100	64	16	19	1

Based on appendix table 10.

Another large group of workers for whom duration of formal training was reported included 141 clerks. These workers had limited, if any, previous exposure to data-processing in their previous jobs. Nevertheless, the formal training period for console operator was typically a week or less, with on-the-job instruction the principal mode for acquiring needed skills. The range of formal instruction duration for programmer jobs for which some of the clerks were trained was mostly from 2 weeks to 8 weeks, with half the workers receiving more than 4 weeks of training. (Appendix table 10.)

Reasons for Outside Hiring

Each establishment visited in the survey reporting that it had hired workers from outside the establishment to man the EDP equipment was asked why it had found it necessary to do so. In the reporting group were 147 installations in which the respondent gave one or more reasons for hiring from the open market; 83 installations that reported no outside hiring. The reasons given for outside hiring are shown in Table V.

Table V. REASON FOR OUTSIDE HIRING OF ELECTRONIC DATA-PROCESSING PERSONNEL

Reason for outside hiring	Number
Total installations	291
Total reporting	230
Reporting no outside hiring	83
Reporting reason for outside hiring	147(a)
Not reporting	61
Total reasons	170(a)
Unavailability of establishment's personnel	53
No employees were available	15
All previously available employees already assigned to electronic data-processing positions	22
Qualified employees working at other essential jobs	9
Employees unwilling to work evening or nigh shifts	5
Employees unwilling to relocate	2
Lack of qualified personnel	37
Employees did not qualify for electronic data-processing positions	22
Employees lacked required aptitude	10
Employees lacked required management potential	3
Employees lacked required education	2
Disinterest of establishment's personnel	17
Lack of interest	9
Employees did not want to become key punch operators	5
Employees felt assignment to electronic data-processing positions would not be an upgrading	2
Trainee salary too low	1
Management needed or preferred experienced workers	48
Lack of time for adequate retraining	12
Easier to hire new personnel	3

a. Some installations reported more than one reason for outside hiring.

Most frequently mentioned among the reasons for unavailability of personnel who could be transferred or reassigned was the previous exhaustion of all potential candidates. The essentiality of qualified individuals in their present jobs and the unwillingness to drain key people from other departments with possible impairment of functioning was a related factor.

The preference for experienced workers was attributed by some respondents to the lack of time for adequate training or to the inability to absorb the burden of displacement and of training new workers simultaneously.

"Lack of qualified personnel" usually reflected insufficient grades on programmer aptitude tests and the judgment that available personnel did not measure up to job requirements.

The size, complexity, and cost of the equipment led some firms to hire outside personnel as a method of increasing the liklihood of successful operation. Several firms employed as director of the EDP unit the consultant who had earlier advised the firm on the question of introducing or expanding such equipment. Insistence that professional personnel such as systems analysts and programmers have college degrees sometimes limited the possibilities for internal recruiting.

The need for persons for work on extra shifts was a factor in some instances. For some firms the availability of experienced personnel in the open market for such beginning jobs as key punch operator was a determining factor.

At the policy level, one firm reported that it sought to obtain a 50-50 balance between employees familiar with electronic data-processing techniques and those familiar with the company's operations.

Equipment Changes and Changing Staff Requirements

The character of the equipment in use and the applications to which it was put changed over time in a number of sampled establishments. For fifteen of these establishments data were available that permitted an analysis to be made of what happened to personnel within the data-processing unit and elsewhere in the establishment when changes in computer configurations took place.

The availability of improved equipment characterized by enlarged computational capacity, increased speed, and lower per-unit processing costs, coupled with the growing awareness within the firm of the potential for additional applications, contributed to the dynamic character of many installations. After the initial conversion from punch-card equipment to a computer, many firms, finding that their first applications were successful, explored the feasibility of adding programs, a process stimulated in some cases by the availability of unused computer time.

Eventually, growth in the number of applications placed on the computer, increased business volume, or a combination of these factors, led to the need for additional equipment or for equipment with greater speed and capacity. The tendency to use up or exceed system capacity, thereby creating a demand for more advanced computers, has been found in other examinations of electronic data-processing installation development. 1/

Changes in computer configurations were not all related to equipment capacity. In some cases, the original equipment was judged to be unsuitable for the uses that developed or relative cost considerations motivated equipment modifications. In three of the 15 cases studied less complex equipment was substituted for more sophisticated equipment. All 15 companies had mechanized some of their office operations through the use of electric accounting machine and punch-card (EAM) equipment at least five years before the date of the visit to the establishment. The predominant tabulating equipment in use prior to the computer installation was either the IBM 402 or IBM 407, with associated card punching, sorting, and other related equipment.

These companies had a substantial background of experience in the machine processing of punch card records for such applications as payroll, accounting, inventory control, sales analysis, budgeting, as well as special industry applications such as flight-load performance statistics, aircraft performance records, insurance statistics, tariff preparation, etc.

Introduction of a computer permitted the handling of a greater volume of records at higher speeds; shifting of additional applications such as general ledger preparation, cost accounting records, insurance policy writing, etc.,from manual to computer processing, and the development of new applications that were not feasible previously(e.g., product control statistics, job cost data, product scheduling and material flows, and engineering calculations). Two firms that had contracted out their work on sales analysis were able to perform this function in their own offices.

The firms studied modified their first computer installation on the average in 31 months. The range was from 15 months to 65 months. Almost half of the establishments modified their installation in the third year of its use. (Table W).

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1. See "Automatic Data Processing Case History" prepared by Harbridge House, Inc., for the Bureau of the Budget, Executive Office of the President, 1963. It discussess in detail cost and staffing changes at various stages of development of the installation in the Electronic Supply Office, Department of the Navy.

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Table W. TIME ELAPSED BETWEEN INSTALLATION OF ORIGINAL COMPUTER AND SUBSEQUENT EXPANSION OR MODIFICATION OF INSTALLATION

Months	Installations	
	Number	Percent
Total	15	100.0
Median elapsed time	(31 months)	-
12 months or less	-	-
13 to 24 months	3	20.0
25 to 36 months	7	46.7
37 to 48 months	2	13.3
49 to 60 months	-	-
Over 60 months	3	20.0

Changes in occupation patterns

In the 15 installations, 461 workers were employed in the electric accounting machine unit prior to introduction of a computer. Approximately 47 percent of these workers were key punch operators or key punch supervisors; 38 percent were peripheral equipment operators or supervisors. The remaining 15 percent were distributed among managerial occupations (5 percent), support personnel (7 percent), schedulers or controllers (3 percent), and systems personnel (less than 1 percent). Chart I and Table X show this and the next steps.

After the first computer was installed, the number of data-processing personnel grew by 13.2 percent to 522 workers. The net change of 61 workers resulted from the addition of 55 programmers, 27 systems analysts, a similar number of 19 console operators, 15 key punch operators, and 2 tape librarians -- a total of 118. These increases were partially offset by declines of 66 in the number of peripheral equipment operators and of 3 workers in the support-personnel group.

At the second stage of computer development the number of personnel in the data processing unit increased by 66 percent to 868. Numerically the largest increase, almost half of the total workers added, were key punch operators and data transcribers.

Chart I

Occupational Profile of Data-Processing Unit at Three Stages of Development

(15 establishments)

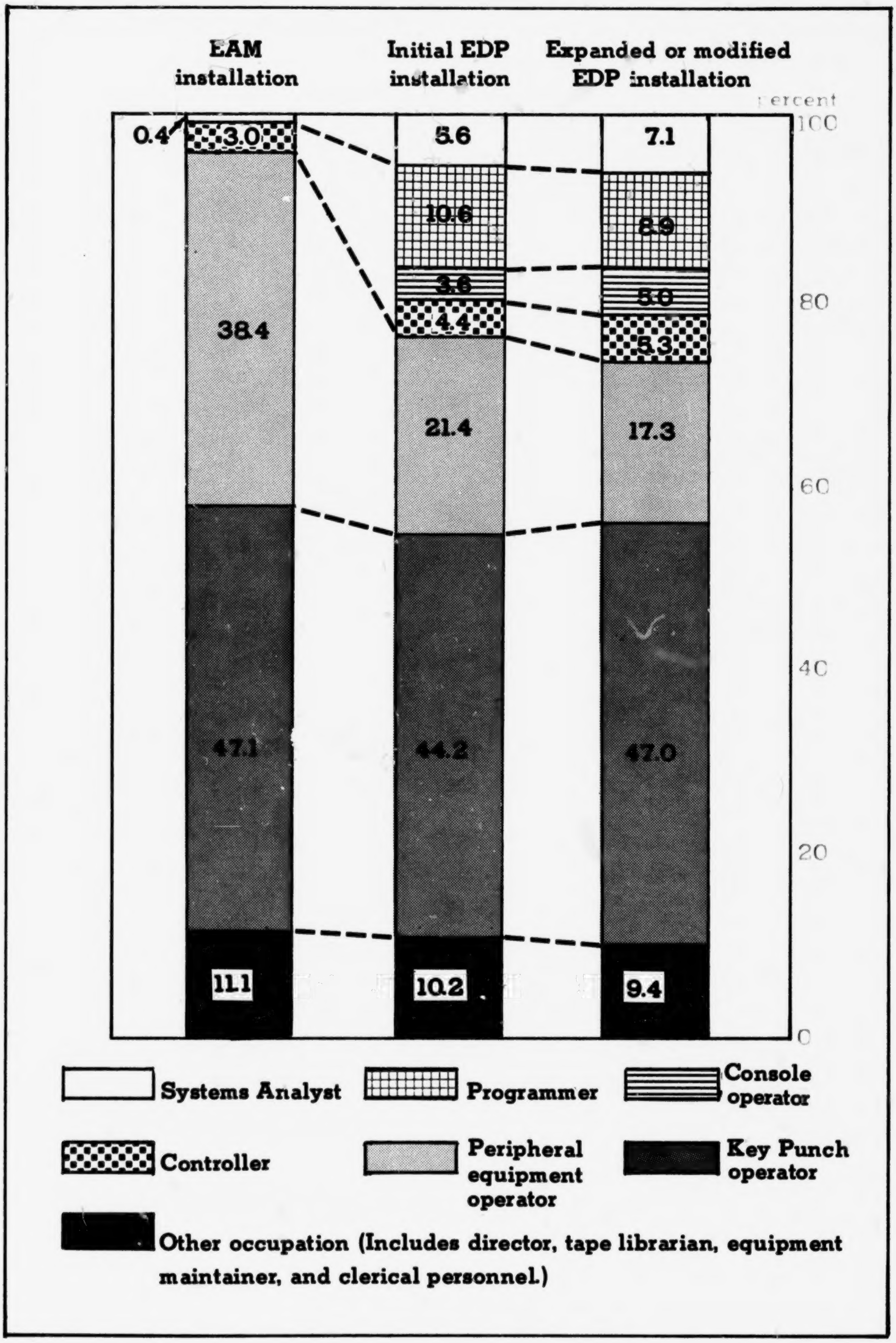

Table X. OCCUPATIONAL PROFILE OF DATA-PROCESSING UNIT AT THREE STAGES OF DEVELOPMENT (15 ESTABLISHMENTS)

OCCUPATION	Stages of development					
	Electronic accounting machine installation		Initial EDP installation		Expanded or modified EDP installation	
	Number	Percent	Number	Percent	Number	Percent
Total	461	100.0	522	100.0	868	100.0
Director, or general supervisor	21	4.6	24	4.6	38	4.4
Systems analyst	2	0.4	29	5.6	62	7.1
Supervising systems analyst	-	-	1	0.2	2	0.2
Supervising systems analyst and programmer	-	-	4	0.8	2	0.2
Systems analyst (all other grades)	2	0.4	6	1.1	24	2.8
Systems analyst and programmer	-	-	18	3.5	34	3.9
Programmer	-	-	55	10.6	77	8.9
Supervising programmer	-	-	2	0.4	4	0.5
Programmer (all other grades)	-	-	53	10.2	73	8.4
Programmer and console operator	-	-	-	-	-	-
Controller or scheduler	14	3.0	23	4.4	46	5.3
Supervising controller or scheduler	2	0.4	4	0.8	7	0.8
Control clerk	12	2.6	19	3.6	39	4.5
Console operator	-	-	19	3.6	43	5.0
Supervising console operator	-	-	-	-	7	0.8
Console operator (all other grades)	-	-	10	1.9	19	2.2
Console and peripheral equipment operator	-	-	9	1.7	17	2.0
Peripheral equipment operator	177	38.4	111	21.4	150	17.3
Supervising peripheral equipment operator	12	2.6	7	1.4	15	1.7
Peripheral equipment operator	165	35.8	104	20.0	135	15.6
Key punch operator or data transcriber	217	47.1	232	44.2	408	47.0
Supervising key punch operator or data transcriber	10	2.2	10	1.9	28	3.2
Key punch operator	200	43.4	218	41.5	375	43.2
Data transcriber	7	1.5	4	0.8	5	0.6
Tape librarian	-	-	2	0.4	2	0.2
Equipment maintainer	-	-	-	-	-	-
Miscellaneous clerical occupations	30	6.5	27	5.2	42	4.8
Supervisor of clerical personnel	7	1.5	1	0.2	2	0.2
Secretary, stenographer, typist, receptionist	1	0.2	4	0.8	6	0.7
Clerk	22	4.8	22	4.2	34	3.9

Although there was a numerical increase in data-processing staff the proportion of workers in some occupations remained relatively stable. Key punch operators were 47 percent of the personnel in the electric accounting machine installation and a similar proportion of the modified computer installation. Managerial and supervisory staff, schedulers and controllers, and support personnel combined remained at about 14 percent of the total staff in both unit record and computer installations. This was not the case, however, with other occupational groups. Peripheral equipment operators dropped from 38 percent of the total staff in electric accounting machine (EAM) installations to 17 percent of the staff in modified computer installations. The systems analyst group rose from less than 1 percent of the total in the electric accounting machine installations to 7 percent in computer installations. The programmer group changed little--from over 10½ percent in the initial installation to about 9 percent in the modified one. Console operators made up approximately 4 percent of the total staff in the initial computer installations and 5 percent in expanded installations.

Sources of workers

The sources from which the required staff was recruited in the 15 firms is shown below:

	EDP staff after -			
	Original conversion		Equipment modification	
	Number	Percent	Number	Percent
Total	522	100.0	868	100.0
Newly hired	43	8.2	181	20.9
Transferred from				
Position in data-processing unit	359	68.8	619	71.3
Position elsewhere in establishment	-	-	-	-
Reassigned from				
Position in data-processing unit	76	14.6	48	5.5
Position elsewhere in establishment	44	8.4	20	2.3

Of the 43 newly hired workers, 15 were key punch operators, 14 were programmers, 4 were console operators, and 10 were in other data-processing occupations.

Most of the programmers needed were found within the establishment--39 workers were reassigned to this position from their previous jobs as peripheral equipment operators (10 workers); accounting clerk (10 workers); and a miscellaney of other occupations including accountant, clerk, supervisor of clerical personnel, etc. (19 workers). Systems analysts were recruited both from former electric accounting machine personnel and from managerial and professional occupations employed elsewhere in the establishment.

At the time of the equipment modification a larger proportion of workers was hired from outside the establishment than when the equipment was first installed-- 21 percent of the staff were newly hired workers compared with 8 percent at the time of the original conversion. Of the newly hired workers 36 percent were key punch operators, 20 percent were tabulating machine operators who were hired to replace some, but not all, of the upgraded former occupants of these jobs, 17 percent were programmers, and 6 percent were systems analysts. The remaining 21 percent were in other data-processing occupations. Only four of 35 programmers added to the staff at this stage came from within the establishment.

Chapter III

WORKERS DISPLACED BY ELECTRONIC DATA-PROCESSING INSTALLATIONS

This section of the report is concerned with the extent to which jobs were eliminated as a result of the installation of computers and what happened to the incumbents thus displaced.

Jobs were considered to have been eliminated if they were abolished or their content or functions were substantially changed -- either as a direct result of the EDP installation or as a result of new systems and procedures that were established as part of the conversion to EDP. Not considered as eliminated were jobs that were shifted from an existing data processing unit to an EDP unit without substantial change in content.

The incumbents of jobs eliminated by an EDP installation could be affected in several ways:

(1) They could be transferred, that is, shifted within the establishment without substantial change in job duties. Included are workers shifted to the EDP unit from other units of the establishment; to other units of the establishment from the EDP unit; or from one nondata-processing unit to another.

(2) They could be reassigned, that is, assigned to another job in the establishment differing substantially in content from the job which they held previously. The reassignment could be to the data-processing unit or to other parts of the establishment.

(3) They could be separated from the employ of the establishment. This could happen involuntarily -- by layoff or discharge -- or the incumbent could voluntarily quit or retire. It was not always possible, however, to tell whether the quits and retirements were in fact voluntary and so distinguishable from layoffs and discharges.

The job change reported is the one that occurred immediately after the EDP installation or modification was completed. Subsequent changes are not shown. Thus the job held by an individual at the time of the field interview as reported in Chapter II may differ from the one to which he was shifted originally and which is shown here.

Jobs Eliminated and Disposition of Workers

The proportion of jobs reported to have been eliminated by the installation of a new or updated computer and associated organizational changes in the 291 installations studied is estimated to be 1.8 percent of the jobs in the establishments in the survey. Since not all EDP installations in all establishments were included in the sample, this proportion is an underestimate of the number of jobs eliminated in these firms.

Of the incumbents of the 9,358 jobs eliminated, 30 percent were separated from the establishment's payroll, 53 percent were reassigned to different jobs, and the remaining 17 percent were transferred to jobs elsewhere in the establishment that were like their old jobs.

In analyzing the displacement effects of the new equipment installations, no adjustments were made in the data for changes in the volume of operations carried on by the businesses studied. Since the period surveyed was one of generally rising production activity, 1/ the number of jobs found to have been eliminated probably was less than the number that would have been found had the economy been in a static or declining phase.

Separations

Incumbents of 2,792 positions were separated from the employ of establishments in which EDP was installed. Of these, 546 were from jobs in data-processing units, while 2,246 were from positions eliminated in other units of the establishment. According to the reports of employers involved, only a minority of the workers were laid off or discharged -- 628 in all. The largest proportion -- 2,164 -- quit, retired, or took leave (a few died), their former jobs not being filled when they left.

Four of five separated workers were clerical workers; 10 percent were peripheral equipment operators; and 6 percent were key puncy operators. The remaining 4 percent were scattered among a variety of occupations. (Table Y.)

Table Y. PREVIOUS OCCUPATION GROUP OF SEPARATED WORKERS

Previous occupation group	Number	Percent
Total workers separated	2,792	100.0
Data-processing occupations	546	19.6
Director or general supervisor	5	0.2
Systems analyst	4	0.1
Programmer	3	0.1
Controller or scheduler	3	0.1
Console operator	6	0.2
Peripheral equipment operator	282	10.2
Key punch operator or data transcriber	164	5.9
Tape librarian	1	(a)
Equipment maintainer	-	-
Miscellaneous clerical personnel	78	2.8
Other occupations	2,246	80.4
Administrative, managerial, and supervisory occupations	9	0.3
Professional occupations	13	0.5
Clerical occupations	2,224	79.6
Supervisor of clerical occupations	2	(a)
Bookkeeping occupations	608	21.8
Office machine operator (other than bookkeeping)	19	0.7
Special industry clerks	853	30.5
Miscellaneous clerical occupations	742	26.6

a. Less than 0.5 of a percent.

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1. The New York State Business Activity Index of the State Department of Commerce rose 19 percent from 1958 to 1963, and factory output rose 20 percent.

Reassignments

Incubents of 5,036 positions were reassigned to jobs involving substantially different duties from ones they had held. Of this group, nearly 2,000 had been in positions in a data-processing unit, while somewhat over 3,000 had been in positions elsewhere in the establishment.

Somewhat fewer than a half of the total (48 percent) of the reassigned workers were shifted within or to the data-processing unit; the other workers being assigned elsewhere in the establishment.

Of the group formerly in a data-processing unit, 1,660 (83 percent) were shifted to new jobs within the unit and 329 (17 percent) were reassigned to other units of the establishment. Of the group fomerly employed outside a data-processing unit, one-quarter (758 workers) were reassigned to jobs in an EDP unit, and three-quarters (2,289 workers) were reassigned to non-data-processing units of the establishment. (See table Z.)

Transfers

A group of 1,557 incumbents were transferred to work units in the establishment other than the one they had been in -- without substantial change in duties and ordinarily in the same or similar title and grade. Their jobs in their old work units were eliminated. (See table Z.)

Table Z. POSITIONS ELIMINATED BY TYPE OF CHANGE AND DISPOSITION OF INCUMBENTS

Type of change and disposition of incumbents	Number	Percent
Total positions affected	9,385	100.0
Transferred	1,557	16.6
To electronic data-processing unit	277	3.0
From other units in establishment	277	3.0
To other units in establishment	1,280	13.6
From a data-processing unit	13	0.1
From other units	1,267	13.5
Reassigned	5,036	53.7
To electronic data-processing unit	2,418	25.8
From a data-processing unit	1,660	17.7
From other units	758	8.1
To other units in establishment	2,618	27.9
From a data-processing unit	329	3.5
From other units	2,289	24.4
Separated	2,792	29.7
From a data-processing unit	546	5.8
From other units	2,246	23.9

Occupations of Workers in Displaced Positions

Numerically the largest groups of workers in eliminated positions were clerical workers, including those in bookkeeping occupations and other kinds of clerks. Within data-processing units peripheral equipment operators and key punch operators were the largest groups displaced (table AA.)

Bookkeeping occupations

Largely because fiscally-centered computer applications were widely used in the sampled establishments, positions involving bookkeeping functions were numerically large among the displaced jobs. Of 2,178 bookkeepers, bookkeeping clerks (a general classification that included accounts receivable clerk, accounts payable clerk, payroll clerk, audit clerk, entry clerk, inventory clerk, posting clerk, etc.), and bookkeeping machine operators, 28 percent were separated, 12 percent were transferred to other units of the establishment; 11 percent were reassigned to the electronic data-processing unit; and 49 percent were reassigned to other units of the establishment.

Special industry clerks

Another group of workers particularly affected were clerical workers performing tasks that are specialized in some industries. These included control clerks, proof clerks, overdraft and report clerks, signature clerks, check filling clerks, etc., in banks; foreclosure clerks, records maintenance clerks, special premium examiners, commission adjustment clerks, renewal rate clerks, etc., in insurance companies; toll rating, sorting and billing clerks, meter order record clerks, balance clerks, etc., in utility companies. These workers were in a particularly vulnerable position when the tasks they performed were reordered to fit the needs of the computer installation. Of the 2,095 special industry clerks in the survey who were in positions eliminated by computerization of the functions performed, 853, or 41 percent, were separated from the establishment. This was the second highest rate of separations found among the occupation groups affected by EDP installations. A total of 365, or 17 percent, were transferred to other units in the establishment without substantial duty changes; 216, or 10 percent, were absorbed in the electronic data-processing section after substantial duty changes, while 661, or 32 percent, were shifted to other jobs within the company.

Other clerical occupations

Clerical occupations of a kind common to most business establishments -- such as general office clerks, stock clerks, file clerks, mail clerks, order clerks, collection clerks, production clerks, cashiers, checkers, shipping and receiving clerks, etc. -- perform routine clerical functions to many of which there was a reduced need when the computer system became operative.

Of the 1,650 occupants of positions eliminated, 40 percent were no longer needed and so were separated from the company's employment; 30 percent were transferred to different units in the establishment; 23 percent were reassigned to new jobs; while only 7 percent were absorbed in the data-processing section through assignment to new duties.

Table AA. WORKERS IN POSITIONS ELIMINATED AND DISPOSITION OF WORKERS BY PRIOR OCCUPATION

Prior occupation	Total	Separated	Transferred	Reassigned to	
				Electronic data-processing unit	Other units in establishment
Total	9,385	2,792	1,557	2,418	2,618
Data-processing occupations	2,548	546	13	1,660	329
Director or general supervisor	258	5	-	243	10
Systems analyst	113	4	-	94	15
Supervising systems analyst	13	-	-	13	-
Supervising systems analyst and programmer	-	-	-	-	-
Systems analyst (all other grades)	97	4	-	78	15
Systems analyst and programmer	3	-	-	3	-
Programmer	11	3	-	7	1
Supervising programmer	-	-	-	-	-
Programmer (all other grades)	11	3	-	7	1
Programmer and console operator	-	-	-	-	-
Controller or scheduler	19	3	-	13	3
Supervising controller and scheduler	13	-	-	10	3
Control clerk	6	3	-	3	-
Console operator	15	6	-	9	-
Supervising console operator	1	-	-	1	-
Console operator (all other grades)	5	-	-	5	-
Console and peripheral equipment operator	9	6	-	3	-
Peripheral equipment operator	1,564	282	9	1,073	200
Supervising peripheral equipment operator	146	8	-	121	17
Peripheral equipment operator	1,418	274	9	952	183
Key punch operator or data transcriber	371	164	-	152	55
Supervising key punch operator or data transcriber	17	3	-	11	3
Key punch operator	329	154	-	125	50
Data transcriber	25	7	-	16	2
Tape librarian	2	1	-	1	-
Equipment maintainer	2	-	-	2	-

Continued

Table AA (continued)

Prior occupation	Total	Separated	Transferred	Reassigned to	
				Electronic data-processing unit	Other units in establishment
Data-processing occupations (continued)					
Miscellaneous clerical personnel	193	78	4	66	45
Supervisor of clerical personnel	5	3	-	-	2
Secretary, stenographer, typist, receptionist	5	4	-	-	1
Clerk	183	71	4	66	42
Other occupations	6,837	2,246	1,544	758	2,289
Administrative, managerial, and supervisory occupations	187	9	49	82	47
Professional occupations:	41	13	5	22	1
Accountant or auditor	6	-	-	6	-
Other professional occupations	35	13	5	16	1
Clerical occupations:	6,603	2,224	1,490	654	2,235
Supervisor of clerical occupations	76	2	1	28	45
Bookkeeper	137	17	5	11	104
Bookkeeping clerk	614	270	143	69	132
Office machine operator (bookkeeping machine)	1,427	321	109	169	828
Office machine operator (other)	327	19	238	21	49
Special industry clerk:	2,095	853	365	216	661
Bank or other financial institution	963	247	86	176	454
Insurance	293	60	74	19	140
Public utility	774	522	203	17	32
Other industry	65	24	2	4	35
Secretary, stenographer, typist, receptionist	277	84	129	26	38
Other clerical occupations	1,650	658	500	114	378
Factory and processing occupations	6	-	-	-	6

Peripheral equipment operators

The positions of 1,564 peripheral equipment operators and supervisors were reported to have been eliminated in the 291 installations surveyed. These workers for the most part were tabulating machine, sorting machine, collating machine, and other EAM machine operators. More than two-thirds (69 percent) of these workers were reassigned to new jobs, usually to more responsible positions, in the computer installation. However, the computer eliminated the need for a fairly large number. Altogether 282 (18 percent) were separated and 200 (13 percent) were reassigned to non-data-processing jobs in other parts of the establishment. A few were transferred to other data-processing units in the same firm.

Key punch operators and data transcribers

Of the incumbents of 371 key punch operator positions displaced, 152 (41 percent) were reassigned to new jobs in the electronic data-processing unit. Another group of 55 key punch operators or data transcribers (15 percent) was reassigned to other units of the establishment. A total of 164 (44 percent) were separated. The proportion of displaced key punch operators who were separated was the highest of all occupations. However, the proportion of key punch operators displaced to total employed in this occupation in the establishment was relatively small.

Appendix tables 11-A, 11-B, 11-C, and 11-D give detailed comparisons of the prior occupation and present occupation of persons who were reassigned from displaced positions.

Skill Level Changes

Job shifts that resulted from the installation of EDP computers were accomplished with virtually no downgrading in the skill level of workers involved. Disregarding workers who were separated, most of the other displaced workers (74.1 percent) ended up in positions having substantially the same skill as their former jobs; almost all the rest (25.6 percent) went to jobs requiring a higher skill level.

These figures are based on the 4,624 jobs of workers for whom the information was available. They are half the displaced workers in the sample. The other half consisted of 2,792 workers who were separated from the company's payroll when their jobs were eliminated; and 1,969 reassigned workers for whom skill information was not available. (See the first part of table BB, whose figures exclude the 2,792 separated workers.)

In these measurements only those shifts in skill level that were substantial were considered to be changes in skill level. The measure of "substantial" is that indicated by (1) a change of two points or more on the composite score of General Educational Development (GED) and Specific Vocational Preparation (SVP) of the United States Bureau of Employment Security's scales of worker requirements (see description in appendix C); or (2) a substantial change in ratings of education, training time, and/or experience as

Table BB. SKILL LEVEL CHANGE OF WORKERS REASSIGNED OR TRANSFERRED BECAUSE OF EDP INSTALLATION

Unit to which shift was made	All shifted workers (a)	Direction of shift of workers reported on: Total	To higher skill level	To same skill level	To lower skill level	No report
Reassigned and transferred workers						
All workers shifted	6,593	4,624	1,184	3,427	13	1,969
Percent distribution	-	100.0	25.6	74.1	0.3	-
To data-processing unit	2,695	2,480	1,159	1,316	5	215
Percent distribution	-	100.0	46.7	53.1	0.2	-
To other unit of establishment	3,898	2,144	25	2,111	8	1,754
Percent distribution	-	100.0	1.2	98.4	0.4	-
Reassigned workers only						
All workers shifted	5,036	3,067	1,184	1,870	13	1,969
Percent distribution	-	100.0	38.6	61.0	0.4	-
To data-processing unit	2,418	2,203	1,159	1,039	5	215
Percent distribution	-	100.0	52.6	47.2	0.2	-
To other unit of establishment	2,618	864	25	831	8	1,754
Percent distribution	-	100.0	2.9	96.2	0.9	-

a. Does not include separated workers (2,792).

shown in a company's job evaluation scale; or (3) at least one step increase in a company's grade progression scale (e.g., junior programmer, programmer, senior programmer, supervising programmer). Where no job evaluation system or grade structure was in use and the job was not one for which GED-SVP scale grades were available, the opinion of the respondent employers was solicited. If possible the opinions of more than one individual in the establishment was obtained. Some respondents tended to overstate skill levels of new jobs, being influenced by such circumstances as the high cost of the installation, the seriousness of breakdowns, and the scarcity of company personnel with knowledge of company procedures and aptitude for computer operations.

The shifted workers remaining at the same skill level (see first part of table BB) include 1,557 transferred workers, who by definition are persons whose jobs have not changed substantially but who were shifted to other work units in the establishment when their previous positions were eliminated. Although it was apparent that minor on-the-job training was involved in these transfers of some jobs from one organizational unit to another, even in jobs with the same title, the principal focus of interest in skill-level change analysis is on reassigned workers -- those whose job content changed substantially. The skill-level change data with respect to (1) workers reassigned to positions in the data-processing unit, and (2) workers reassigned to other units of the establishment are summarized in the second part of table BB.

(1) For more than half (53 percent) of the 2,203 workers reassigned to the data-processing unit, for whom information on skill-level change was available, the new job involved a higher level of skill than their previous position; 47 percent were moved to jobs at approximately the same skill level; a few workers were downgraded. (Appendix table 12-A.)

The occupational group with the highest proportion of upgraded workers was supervising peripheral equipment operator, 92 percent of those reassigned were upgraded; and peripheral equipment operators, 85 percent of whom were upgraded in the reassignment process. Most of these were tabulating machine operators. Most were reassigned to work involving console operation.

On the other hand, only a small proportion of reassigned key punch operators and data transcribers (about 18 percent of those for whom skill level change was reported) were assigned to higher level jobs. These usually involved promotion to more responsible jobs in the data input section, such as supervising key punch operator. A few became programmers and console operators. The others were assigned to office clerk jobs or to the operation of types of equipment different from that formerly used. (Appendix table 11-A.)

Persons with no previous data-processing experience who were brought into the electronic data-processing unit did not fare as well, promotion-wise, as individuals with data-processing experience. Of the 615 workers lacking such experience for whom information is available, 19 percent were upgraded from their previous jobs. The other workers were reassigned laterally without change in skill level. Lack of change in skill level was especially apparent in the case of office machine operators and NCR posting machine operators in banks, who were reassigned to such jobs as inscriber operator, control clerk, and peripheral equipment operator. (Appendix table 11-B.)

(2) Information on changes in skill level was available for 864 of the 2,618 workers who were reassigned to jobs other than in the electronic data-processing unit. (Appendix table 12-B.) Of the 83 workers who were formerly in the data-processing unit and were shifted elsewhere in the organization, 13 percent went to higher skill level jobs. Most workers in this group were reassigned to general clerical work at skill levels comparable to that of their previous jobs. (For detail, see appendix table 11-C.)

Of the 781 workers who were shifted from displaced positions outside the electronic data-processing unit to non-data-processing positions elsewhere in the establishment for whom information on skill change was available, only 2 percent were upgraded in skill; 1 percent were downgraded; the other 97 percent remained at the same skill level in their new jobs as they had in their old ones. More than three of five workers in this reporting group had been bookkeepers, bookkeeping clerks, or bookkeeping machine operators. Of these 478 workers, 329 were reassigned to special industry clerk positions; 58 to different work in accounting or bookkeeping units; 50 to general clerical jobs; 30 to stenographic or typing jobs; and 10 of the other 11 workers to supervisory positions. Another large group -- 157 workers -- had previously been special industry clerks. Sixty-four percent of these workers were reassigned to different specialized clerical duties; 26 percent were reassigned to general clerical duties; the remaining 10 percent went to supervisory jobs, to secretarial work, and to the job of bookkeeping clerk. The third large occupational group among the 781 workers reassigned outside the EDP unit were 113 workers who had been in general clerical occupations. Virtually all of these workers were absorbed in either specialized or general clerical work different from that previously performed. Most of the remaining 33 workers had been office machine operators and these workers were shifted to specialized clerical duties. (Appendix table 11-D.)

APPENDIXES

APPENDIX A. DEFINITIONS OF DATA-PROCESSING OCCUPATIONS

All occupations found in data-processing units were classified into ten groups, defined as follows:

1. Director or general supervisor

A group of occupations whose responsibilities include direction, coordination, planning, and production activities of a data-processing division, section, or unit. Includes such occupations as director, computing center; director, data-processing; director, business systems equipment; project director; manager, data-processing; manager, operations; manager, machine accounting; supervisor, data-processing systems; supervisor, special services; shift chief; shift supervisor; operations coordinator. Includes assistants.

2. Systems analyst

A group of occupations whose responsibilities include devising system requirements and layout, and developing procedures for processing data by means of data-processing equipment. May formulate mathematical statements of engineering, scientific, or business problems, and devise solutions of problems through use of data-processing equipment.

a. Supervising systems analyst is in charge of a group of systems analysts. Includes project planner; chief, operations planning; supervising analyst (accounting); supervising analyst (scientific); supervising systems resident;supervising electronic research analyst; supervising digital computer analyst; supervising program analyst; supervising methods analyst; supervising procedures designer; supervising systems specialist, etc.

b. Systems analyst (all other grades) devises computer system requirements and layout, and develops procedures to process data by means of data-processing equipment. Includes procedure analyst; computing analyst; tabulating procedures analyst; methods and procedures analyst; programs analyst; systems specialist, etc. Includes,also, junior and senior grades and trainees.

3. Programmer

A group of occupations whose duties entail the preparation of detailed directions according to which the computer may carry out the various sequential operations required to process data.

a. Supervising programmer plans, schedules, and supervises the preparation of programs to process data by means of electronic data-processing equipment. Assigns and coordinates the work of programmers engaged in writing programs and routines. Designs standard programming procedures, trains subordinates, reviews and evalutes the work of staff, and prepares periodic performance reports. Includes such occupations as chief programmer; administrative assistant, programming; programming manager.

b. Programmer (all other grades) develops and prepares diagrammatic plans for solution of scientific, mathematical, business or technical problems by means of electronic data-processing equipment. Translates plans into machine language. Analyses equipment capabilities and limitations to adapt program to machine configuration. Designs detailed programs, flow charts, and diagrams indicating the sequence of machine operations necessary to process data and print solutions. Verifies accuracy and completeness of programs; tests and debugs programs; prepares instruction sheet to guide console operator during production run. Includes,also, junior and senior programmers and programmer trainees.

4. Controller or scheduler

A group of occupations having responsibility for the efficient use of the computer and of peripheral equipment and for data coordination and control.

a. Supervising controller or scheduler schedules operating time on the available equipment; assigns priorities and arranges for sequencing of operations. He is responsible for data coordination and control and supervises report distribution. Includes control captain, shift chief, operations coordinator, etc.

b. Control clerk is responsible for one or more basic control functions.

5. Console operator

A group of occupations whose duties involve monitoring and controlling an electronic computer.

a. Supervising console operator is responsible for supervising the operation of one or more computers. Includes chief operator; assistant chief operator.

b. Console operator (all other grades) controls and directs the operation of the main computer and "on-line" components by manipulation of the computer console. Includes junior console operator; junior computer operator; senior console operator; electronic console operator; system operator; EDP machine operator A and B; electronic computer technician, etc.

6. Peripheral equipment operator

A group of occupations that operates equipment associated with or supporting the computer.

a. Supervising peripheral equipment operator is responsible for supervising the activities of a group of peripheral equipment operators. Includes supervisor, tabulating operations, group leader, tabulating; head, converter team, etc.

b. Peripheral equipment operator (all other grades) operates one or more pieces of equipment. Includes tabulating machine operator; high-speed printer operator; card-to-tape converter operator, tape handler; electronic auxiliary machine operator; peripheral operator A and B; accounting machine operator; sorter operator; operator of character reading devices, etc. Includes, also, junior and senior grades and trainees.

7. Keypunch operator or data transcriber

A group of occupations whose duties involve the operation of equipment that prepares cards or tapes for subsequent computer operations.

a. Supervising key punch operator or data transcriber supervises the work of a key punching or data transcribing unit. Includes head teletype operator; lead key punch operator.

b. Key punch operator (all other grades) records data on cards by means of a key-punch machine. Verifies information punched. Includes verifier; senior key punch operator.

c. Data transcriber (all other grades) operates a variety of office machines and related equipment, such as Teletype, Unityper, Flexowriter, Computyper, etc., to prepare tapes and cards for subsequent data-processing operations. Includes data typist; input operator; senior input operator;teletyper; computyper operator; check inscriber operator, encoder, tape puncher operator, etc.

8. Tape librarian is responsible for filing, mounting, and caring for magnetic or punched paper tape use for electronic data-processing purposes. Includes all grades.

9. Equipment maintainer tests repairs, and adjusts electronic computers and auxiliary electronic and other equipment. Includes machine technician; computer technician; service engineer; electronics mechanic; maintenance technician.

10. Miscellaneous clerical personnel

Clerical personnel directly supporting the activities of the data-processing unit.

a. Supervisor of clerical personnel supervises a group of clerical workers in support of the data-processing function.

b. Secretary, stenographer, typist, receptionist. Includes all grades.

c. Clerk. Includes tub file clerk, operations clerk, card and tape file clerk, etc.

NOTE: The material in this appendix is based on U. S. Department of Labor, Manpower Administration, Bureau of Employment Security, Occupations in Electronic Computing Systems (1965) and on job descriptions supplied by reporting establishments.

APPENDIX B. GUIDELINES USED IN ESTIMATING SKILL CHANGES

The task of comparing the skill level of a worker's present job with that of the one he previously held involved judgments regarding magnitude of skill change and the use of an appropriate scale on which to measure such change. Involved were a broad range of administrative, professional, technical, and clerical jobs in a variety of industries.

The principal available tools were the occupational definitions, functional analyses, and related scales of general educational development (GED) and specific vocational preparation (SVP) developed in connection with the Dictionary of Occupational Titles. The majority of job titles found in the firms visited occurred in the Dictionary.

On pages 71 and 72, below, are tables explaining the various levels of GED and SVP. They are taken from U. S. Department of Labor, Bureau of Employment Security, Dictionary of Occupational Titles, 1965 edition, volume II, "Occupational Classification and Industry Index," pp. 652-653.

A composite scale on which to measure skill change was constructed by combining the values for general educational development (GED) and specific vocational preparation (SVP). This scale provided a method of comparing the skill levels of listed occupations. Job changes involving two points or more on this combined scale were considered to have changed in skill substantially. For example, a typist (composite score 7) who became a key punch operator (composite score 8) was not considered in this study to have been reassigned to a job that required substantially more skill than the one she previously had. On the other hand, a tabulating machine operator (composite score 8) who became a programmer (composite score 12) was regarded as having been reassigned to a higher skill-level position.

Using this system the skill level compared was that of the typical worker in the organization performing tasks in the job title, i.e., the average skill for the job. In practice of course individuals with the same job title perform work involving a range of skills. However, the attainments of the individual incumbent were not used since the information used in determining skill level change was the job description.

Jobs not described in the Dictionary of Occupational Titles were found in the establishments surveyed. In a number of firms formal job evaluation systems were found in which education, previous experience, and in some cases training time, were among the factors measured in evaluating the job for salary administration purposes. When the firm had such a system and the job title could not be matched with those of DOT, the weights assigned to these factors in the system used by the firm were added to ascertain relative skill requirements for this group of jobs in the particular establishment.

There were other firms that did not have a point system for evaluating jobs but had a hierarachy of titles in an occupation, such as "junior," "senior," "supervisors," etc. These grade or classification levels were used to measure skill changes in the absence of a more precise scale. For example, a tabulating machine operator who was reassigned to a position as supervising tabulating machine operator was considered upgraded. On the other hand, a supervising clerk who became a tabulating machine operator under most circumstances was considered downgraded.

A small number of jobs were found that were not listed in DOT nor in firms that had no formal system of job evaluation or classification. In these cases, the magnitude of the skill change was based on management opinion. Interviewers were asked to check with respondents whether in fact the new job required a higher level of skill than the previous one. An especially close check was made in the case of supervisory titles. Relevant evidence of upgrading included an increase in the size of the staff to be supervised, an increase in the length of experience required to qualify for the new as compared with the previous job, and the relative complexity of the operation that was to be supervised.

GENERAL EDUCATIONAL DEVELOPMENT

Level	Reasoning Development	Mathematical Development	Language Development
6	Apply principles of logical or scientific thinking to a wide range of intellectual and practical problems. Deal with nonverbal symbolism (formulas, scientific equations, graphs, musical notes, etc.) in its most difficult phases. Deal with a variety of abstract and concrete variables. Apprehend the most abstruse classes of concepts.	Apply knowledge of advanced mathematical and statistical techniques such as differential and integral calculus, factor analysis, and probability determination, or work with a wide variety of theoretical mathematical concepts and make original applications of mathematical procedures, as in empirical and differential equations.	Comprehension and expression of a level to —Report, write, or edit articles for such publications as newspapers, magazines, and technical or scientific journals. Prepare and draw up deeds, leases, wills, mortgages, and contracts. —Prepare and deliver lectures on politics, economics, education, or science. —Interview, counsel, or advise such people as students, clients, or patients, in such matters as welfare eligibility, vocational rehabilitation, mental hygeine, or marital relations. —Evaluate engineering technical data to design buildings and bridges.
5	Apply principles of logical or scientific thinking to define problems, collect data, establish facts, and draw valid conclusions. Interpret an extensive variety of technical instructions, in books, manuals, and mathematical or diagrammatic form. Deal with several abstract and concrete variables.		
4	Apply principles of rational systems[1] to solve practical problems and deal with a variety of concrete variables in situations where only limited standardization exists. Interpret a variety of instructions furnished in written, oral, diagrammatic, or schedule form.	Perform ordinary arithmetic, algebraic, and geometric procedures in standard, practical applications.	Comprehension and expression of a level to —Transcribe dictation, make appointments for executive and handle his personal mail, interview and screen people wishing to speak to him, and write routine correspondence on own initiative. —Interview job applicants to determine work best suited for their abilities and experience, and contact employers to interest them in services of agency. —Interpret technical manuals as well as drawings and specifications, such as layouts, blueprints, and schematics.
3	Apply common sense understanding to carry out instructions furnished in written, oral, or diagrammatic form. Deal with problems involving several concrete variables in or from standardized situations.	Make arithmetic calculations involving fractions, decimals and percentages.	Comprehension and expression of a level to —File, post, and mail such material as forms, checks, receipts, and bills. —Copy data from one record to another, fill in report forms, and type all work from rough draft or corrected copy. —Interview members of household to obtain such information as age, occupation, and number of children, to be used as data for surveys, or economic studies. —Guide people on tours through historical or public buildings, describing such features as size, value, and points of interest.
2	Apply common sense understanding to carry out detailed but uninvolved written or oral instructions. Deal with problems involving a few concrete variables in or from standardized situations.	Use arithmetic to add, subtract, multiply, and divide whole numbers.	
1	Apply common sense understanding to carry out simple one- or two-step instructions. Deal with standardized situations with occasional or no variables in or from these situations encountered on the job.	Perform simple addition and subtraction, reading and copying of figures, or counting and recording.	Comprehension and expression of a level to —Learn job duties from oral instructions or demonstration. —Write identifying information, such as name and address of customer, weight, number, or type of product, on tags, or slips. —Request orally, or in writing, such supplies as linen, soap, or work materials.

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[1] Examples of "principles of rational systems" are: Bookkeeping, internal combustion engines, electric wiring systems, house building, nursing, farm management, ship sailing.

SPECIFIC VOCATIONAL PREPARATION

Specific Vocational Preparation: The amount of time required to learn the techniques, acquire information, and develop the facility needed for average performance in a specific job-worker situation. This training may be acquired in a school, work, military, institutional, or avocational environment. It does not include orientation training required of even every fully qualified worker to become accustomed to the special conditions of any new job. Specific vocational training includes training given in any of the following circumstances:

a. Vocational education (such as high school commercial or shop training, technical school, art school, and that part of college training which is organized around a specific vocational objective);
b. Apprentice training (for apprenticeable jobs only);
c. In-plant training (given by an employer in the form of organized classroom study);
d. On-the-job training (serving as learner or trainee on the job under the instruction of a qualified worker);
e. Essential experience in other jobs (serving in less responsible jobs which lead to the higher grade job or serving in other jobs which qualify).

The following is an explanation of the various levels of specific vocational preparation.

Level	Time	Level	Time
1	Short demonstration only.	5	Over 6 months up to and including 1 year.
2	Anything beyond short demonstration up and including 30 days.	6	Over 1 year up to and including 2 years.
3	Over 30 days up to and including 3 months.	7	Over 2 years up to and including 4 years.
4	Over 3 months up to and including 6 months.	8	Over 4 years up to and including 10 years.
		9	Over 10 years.

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Table 1. ESTABLISHMENTS AND ELECTRONIC DATA-PROCESSING INSTALLATIONS IN SURVEY: DISTRIBUTION BY INDUSTRY GROUP

Industry group	Establishments	Electronic data-processing installations			
		Total	One installation	Two installations	Four installations
	Number				
All industries	277	291	265	22	4
Manufacturing	94	100	88	12	-
Durable goods	55	60	50	10	-
Nondurable goods	39	40	38	2	-
Transportation and public utilities	21	22	20	2	-
Wholesale and retail trade	25	25	25	-	-
Finance, insurance,and real estate	72	73	71	2	-
Banking	23	23	23	-	-
Insurance	30	31	29	2	-
Other finance agencies	19	19	19	-	-
Services	43	45	41	4	-
Personal services	2	2	2	-	-
Miscellaneous business services	15	16	14	2	-
Educational services	6	7	5	2	-
Other services	20	20	20	-	-
Government	22	26	20	2	4
	Percent distribution				
All industries	100.0	100.0	100.0	100.0	100.0
Manufacturing	33.9	34.3	33.2	54.5	-
Durable goods	19.8	20.6	18.9	45.4	-
Nondurable goods	14.1	13.7	14.3	9.1	-
Transportation and public utilities	7.6	7.6	7.5	9.1	-
Wholesale and retail trade	9.0	8.6	9.4	-	-
Finance, insurance,and real estate	26.0	25.1	26.9	9.1	-
Banking	8.3	7.9	8.8	-	-
Insurance	10.8	10.7	10.9	9.1	-
Other finance agencies	6.9	6.5	7.2	-	-
Services	15.5	15.5	15.5	18.2	-
Personal services	0.7	0.7	0.8	-	-
Miscellaneous business services	5.4	5.5	5.3	9.1	-
Educational services	2.2	2.4	1.9	9.1	-
Other services	7.2	6.9	7.5	-	-
Government	8.0	8.9	7.5	9.1	100.0

Table 2. COMPUTERS IN SURVEY: DISTRIBUTION BY SIZE OF INSTALLATION AS MEASURED BY NUMBER OF WORKERS IN ELECTRONIC DATA-PROCESSING OCCUPATIONS

Computer installation	Number of workers	All Instal-lations	No workers (a)	Less than 10 workers	10 to 24 workers	25 to 49 workers	50 to 74 workers	75 to 99 workers	100 to 199 workers	200 to 299 workers	300 workers or more
Total	13,743	291	6	47	90	65	33	20	18	7	5
Single computer installations	5,621	209	5	46	85	47	14	6	3	1	1
Alwac III-E	1	1	-	1	-	-	-	-	-	-	-
Bendix G-15	18	4	-	4	-	-	-	-	-	-	-
Burroughs											
205	16	3	-	3	-	-	-	-	-	-	-
220	68	4	-	1	2	1	-	-	-	-	-
B 251	16	1	-	-	1	-	-	-	-	-	-
CDC 160	8	1	-	1	-	-	-	-	-	-	-
Clary DE-60	4	1	-	1	-	-	-	-	-	-	-
GE 210	20	1	-	-	1	-	-	-	-	-	-
Honeywell											
400	25	1	-	-	-	1	-	-	-	-	-
800	155	2	-	-	-	1	-	-	1	-	-
IBM											
305	293	21	-	6	13	2	-	-	-	-	-
650	620	17	-	3	4	5	3	1	1	-	-
1401	2,999	105	-	9	53	30	8	3	1	1	-
1410	98	2	-	-	-	1	1	-	-	-	-
1620	150	17	3	10	3	-	1	-	-	-	-
7070	565	2	-	-	1	-	-	-	-	-	1
LGP 30	11	5	2	3	-	-	-	-	-	-	-
NCR											
304	8	1	-	1	-	-	-	-	-	-	-
315	87	1	-	-	-	-	-	1	-	-	-
390	7	2	-	2	-	-	-	-	-	-	-

continued

Table 2 (continued)

Computer installation	Number of workers	All Instal-lations	No workers (a)	Less than 10 workers	10 to 24 workers	25 to 49 workers	50 to 74 workers	75 to 99 workers	100 to 199 workers	200 to 299 workers	300 workers or more
Single computer installations (continued)											
RCA											
301	54	2	-	-	-	2	-	-	-	-	-
501	17	1	-	-	1	-	-	-	-	-	-
Sperry-Rand											
Univac file	102	2	-	-	-	1	1	-	-	-	-
Univac 80 or 90	245	9	-	1	4	3	-	1	-	-	-
Univac I	12	1	-	-	1	-	-	-	-	-	-
Univac II	15	1	-	-	1	-	-	-	-	-	-
Teleregister Telefile	8	1	-	1	-	-	-	-	-	-	-
Multiple computer installations	8,121	82	1	-	5	18	19	14	15	6	4
GE 210 (2)	21	1	-	-	1	-	-	-	-	-	-
IBM											
305 (1); 1401 (1)	132	4	-	-	1	2	1	-	-	-	-
305 (2); 1401 (1)	31	1	-	-	-	1	-	-	-	-	-
305 (1); 650 (1); 1401 (1)	30	1	-	-	-	1	-	-	-	-	-
650 (1); 1401 (1)	326	7	-	-	-	4	3	-	-	-	-
650 (1); 1401 (2)	95	1	-	-	-	-	-	1	-	-	-
650 (2)	53	1	-	-	-	-	1	-	-	-	-
650 (1); 1620 (1)	61	1	-	-	-	-	1	-	-	-	-
1401 (2)	766	12	-	-	1	5	3	-	3	-	-
1401 (3)	208	2	-	-	-	1	-	-	1	-	-
1401 (1); 1410 (1)	69	1	-	-	-	-	1	-	-	-	-
1401 (2); 1410 (1)	58	1	-	-	-	-	1	-	-	-	-
1401 (1); 1620 (1)	37	1	-	-	-	1	-	-	-	-	-
1620 (2)	11	2	1	-	1	-	-	-	-	-	-
705 (1); 1401 (1)	130	1	-	-	-	-	-	-	1	-	-
705 (1); 1401 (2)	206	1	-	-	-	-	-	-	-	1	-
705 (1); 1401 (4); 1410 (1)	281	1	-	-	-	-	-	-	-	1	-
7070 (1); 1401 (1)	890	10	-	-	-	2	4	-	4	-	-
7070 (1); 1401 (2)	576	6	-	-	-	-	2	2	2	-	-
7070 (1); 1401 (3)	98	1	-	-	-	-	-	1	-	-	-

continued

Table 2 (continued)

Computer installation	Number of workers	All installations	No workers (a)	Less than 10 workers	10 to 24 workers	25 to 49 workers	50 to 74 workers	75 to 99 workers	100 to 199 workers	200 to 299 workers	300 workers or more
Multiple computer installations (continued)											
IBM (continued)											
7070 (1); 1401 (4)	315	1	-	-	-	-	-	-	-	-	1
7070 (1); 1401 (1); 650 (1)	80	1	-	-	-	-	-	1	-	-	-
7070 (2); 1401 (7)	428	1	-	-	-	-	-	-	-	-	1
7074 (1); 1401 (2)	371	1	-	-	-	-	-	-	-	-	1
7074 (1); 1401 (4)	177	2	-	-	-	-	-	2	-	-	-
7074 (1); 1401 (6)	250	1	-	-	-	-	-	-	-	1	-
7080 (1); 1401 (2)	236	1	-	-	-	-	-	-	-	1	-
7080 (1); 1401 (3)	274	2	-	-	-	-	-	-	2	-	-
7080 (1); 1401 (5)	297	1	-	-	-	-	-	-	-	1	-
7090 (1); 1401 (1)	41	2	-	-	1	1	-	-	-	-	-
7090 (1); 1401 (2)	92	1	-	-	-	-	-	1	-	-	-
7090 (2); 1401 (2)	63	1	-	-	-	-	1	-	-	-	-
IBM and other											
705 (1); 1401 (3); 1620 (1); RCA 501 (3); RCA BIZMAC (2)	371	1	-	-	-	-	-	-	-	-	1
7080 (1); 705 (1); 1401 (4); Honeywell 800 (1)	235	1	-	-	-	-	-	-	-	1	-
Sperry-Rand											
Univac I (2)	162	2	-	-	-	-	1	1	-	-	-
Univac I (1); Univac II (1)	100	1	-	-	-	-	-	-	1	-	-
Univac 80 or 90 (2)	190	2	-	-	-	-	-	1	1	-	-
Univac 1105 (1); Univac 80 (1)	99	1	-	-	-	-	-	1	-	-	-
RCA											
301 (1); 501 (1)	178	2	-	-	-	-	-	2	-	-	-
301 (2); 501 (1)	83	1	-	-	-	-	-	1	-	-	-

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a. These establishments have computers that are operated by engineers or other professional personnel on occasion.

Table 3. CENTRAL COMPUTERS IN SURVEY: DISTRIBUTION BY YEAR INSTALLED

Year installed (a)	Number	Percent
Total	291	100.0
1955	3	1.0
1956	10	3.4
1957	11	3.8
1958	12	4.1
1959	18	6.2
1960	40	13.8
1961	83	28.5
1962	104	35.8
1963 (b)	10	3.4

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a. Refers to year of installation of computer in use in single computer installations and year of installation of oldest computer in use in multi-computer installations.

b. First four months.

Table 4. ILLUSTRATIVE COMPUTER APPLICATIONS IN USE REPORTED BY ESTABLISHMENTS IN SURVEY: DISTRIBUTION BY INDUSTRY SECTOR

Industry sector; computer application (a)	Establishments reporting	Industry sector		
		Manufacturing	Nonmanufacturing	Government
Total establishments	277	94	161	22
General industry applications				
Accounting				
Payroll	155	73	72	10
General ledger, accounts receivable/payable	150	64	80	6
Inventory control	99	63	28	8
Cost accounting	55	37	13	5
Financial statements	16	5	11	-
General expense distribution	15	6	9	-
Fixed asset accounting	13	7	6	-
Stockholder accounting	6	3	3	-
Tax reports	5	3	2	-
Other accounting applications	14	9	5	-
Sales analysis and market research	87	57	30	-
Statistical analysis and statistical reports	69	15	46	8
Production scheduling and control	58	51	6	1
Engineering design and product analysis	58	28	27	3
Purchase and sales order processing	51	21	24	6
Addressing, printing, checkwriting	8	2	6	-
Special industry applications (selected industries)				
Banks and credit agencies (23 establishments in survey)				
Demand deposit accounting	9	-	9	-
Installment loans accounting	8	-	8	-
Trust applications	5	-	5	-
Mortgage accounting	4	-	4	-
Special checking accounts	4	-	4	-
Xmas and thrift accounts	4	-	4	-
Interest accruals	2	-	2	-
Portfolio management	2	-	2	-
Travelers checks	2	-	2	-
Other (includes life insurance billing, window transactions, service charges, rediscount operations, etc.)	6	-	6	-

continued

Table 4 - continued

Industry sector; computer application (a)	Establishments reporting	Industry sector: Manufacturing	Industry sector: Non-manufacturing	Industry sector: Government
Stock brokers and stock exchanges (18 establishments in survey)				
Stock record	15	-	15	-
Purchases and sales	11	-	11	-
Interest and dividend calculations	8	-	8	-
Margin and cash accounts	8	-	8	-
Customer statements	6	-	6	-
Confirmation notices	5	-	5	-
Commission reports	4	-	4	-
Insurance carriers (21 establishments in survey)				
Premium billing and accounting	14	-	14	-
Agency accounting	10	-	10	-
Loss statistics	10	-	10	-
Experience rating statistics	7	-	7	-
Underwriting	7	-	7	-
Policy writing and policy issuance	6	-	6	-
File maintenance	5	-	5	-
Claims processing	4	-	4	-
Calculation of reserves	4	-	4	-
Mortgage accounting	4	-	4	-
Commission statements	4	-	4	-
Dividend calculations	3	-	3	-
Renewals	3	-	3	-
Rating Board reports	2	-	2	-
Collection records	2	-	2	-
Insurance reimbursement reports	1	-	1	-

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a. No uniform system for classifying applications has been developed. The one used here is a modification of the system developed by Neil Macdonald, Assistant Editor, in Computers and Automation, June 1961.

Table 5. LOCATION OF ELECTRONIC DATA-PROCESSING INSTALLATION IN THE ORGANIZATIONAL STRUCTURE OF THE ESTABLISHMENT

Organizational unit	Number	Percent
Total	291	-
Total reporting	216	100.0
Finance or accounting departments	129	59.7
Controller's office	59	27.4
Accounting or audit department	46	21.3
Treasurer's office	13	6.0
Finance division	11	5.0
Research, statistics, actuarial or engineering departments	27	12.5
Engineering department	11	5.0
Research department	5	2.3
Statistics department	5	2.3
Research laboratory	3	1.4
Electronics department	2	1.0
Actuarial department	1	0.5
Administrative departments	23	10.6
Administrative and personnel service departments	16	7.3
Systems department	6	2.8
Regional management	1	0.5
Data-processing divisions	20	9.2
Operating departments	15	7.0
Operators' division	13	6.0
Production department	2	1.0
Other organizational units	2	1.0
Customer service center	1	0.5
Exchange unit	1	0.5
Not reporting	75	-

Table 6. PRESENT AND PRIOR OCCUPATION OF PERSONNEL REASSIGNED TO ELECTRONIC DATA-PROCESSING INSTALLATIONS:

A. All installations combined

Present occupation	Total	Total reporting prior occupation	Prior occupation: Director or general supervisor	Supervising systems analyst	Systems analyst (all other grades)	Systems analyst and programmer	Supervising programmer	Programmer (all other grades)	Programmer and console operator	Supervising controller or scheduler	Control clerk
Total	3,721	3,116	244	6	114	4	1	7	1	11	8
Director or general supervisor	445	378	217	1	13	1	1	1	-	10	-
Systems analyst	389	299	8	5	74	3	-	1	-	-	-
Supervising systems analyst	24	19	2	4	3	-	-	-	-	-	-
Supervising systems analyst and programmer	16	15	-	1	-	-	-	-	-	-	-
Systems analyst (all other grades)	230	180	4	-	56	3	-	1	-	-	-
Systems analyst and programmer	119	85	2	-	15	-	-	-	-	-	-
Programmer	662	561	13	-	25	-	-	5	1	-	-
Supervising programmer	34	24	1	-	-	-	-	2	-	-	-
Programmer (all other grades)	620	529	12	-	25	-	-	3	1	-	-
Programmer and console operator	8	8	-	-	-	-	-	-	-	-	-
Controller or scheduler	152	122	-	-	-	-	-	-	-	-	3
Supervising controller and scheduler	11	8	-	-	-	-	-	-	-	-	-
Control clerk	141	114	-	-	-	-	-	-	-	-	3
Console operator	783	727	3	-	2	-	-	-	-	-	-
Supervising console operator	80	71	3	-	1	-	-	-	-	-	-
Console operator (all other grades)	472	429	-	-	1	-	-	-	-	-	-
Console and peripheral equipment operator	231	227	-	-	-	-	-	-	-	-	-
Peripheral equipment operator	286	232	3	-	-	-	-	-	-	-	3
Supervising peripheral equipment operator	45	42	3	-	-	-	-	-	-	-	-
Peripheral equipment operator	241	190	-	-	-	-	-	-	-	-	3
Key punch operator or data transcriber	742	623	-	-	-	-	-	-	-	1	-
Supervising key punch operator or data transcriber	90	45	-	-	-	-	-	-	-	1	-
Key punch operator	263	206	-	-	-	-	-	-	-	-	-
Data transcriber	389	372	-	-	-	-	-	-	-	-	-
Tape librarian	63	45	-	-	-	-	-	-	-	-	2
Equipment maintainer	3	3	-	-	-	-	-	-	-	-	-
Miscellaneous clerical personnel	196	126	-	-	-	-	-	-	-	-	-
Supervisor of clerical personnel	3	3	-	-	-	-	-	-	-	-	-
Secretary, stenographer, typist, receptionist	3	1	-	-	-	-	-	-	-	-	-
Clerk	190	122	-	-	-	-	-	-	-	-	-

Continued

Table 6A - continued

Present occupation	Prior occupation										
	Supervising console operator	Console operator (all other grades)	Console and peripheral equipment operator	Supervising peripheral equipment operator	Peripheral equipment operator	Supervising key punch operator or data transcriber	Key punch operator	Data transcriber	Tape librarian	Equipment maintainer	Clerk
Total	1	16	2	106	970	5	116	5	1	2	39
Director or general supervisor	-	-	2	16	14	-	-	-	-	-	-
Systems analyst	-	-	-	4	27	-	-	-	-	-	-
Supervising systems analyst	-	-	-	-	-	-	-	-	-	-	-
Supervising systems analyst and programmer	-	-	-	-	1	-	-	-	-	-	-
Systems analyst (all other grades)	-	-	-	2	15	-	-	-	-	-	-
Systems analyst and programmer	-	-	-	2	11	-	-	-	-	-	-
Programmer	1	6	-	27	197	-	2	-	-	-	1
Supervising programmer	-	-	-	4	4	-	-	-	-	-	-
Programmer (all other grades)	1	6	-	23	191	-	2	-	-	-	1
Programmer and console operator	-	-	-	-	2	-	-	-	-	-	-
Controller or scheduler	-	-	-	2	6	-	7	-	-	-	2
Supervising controller and scheduler	-	-	-	2	-	-	-	-	-	-	-
Control clerk	-	-	-	-	6	-	7	-	-	-	2
Console operator	-	8	-	56	557	-	3	-	1	-	1
Supervising console operator	-	3	-	38	18	-	-	-	-	-	-
Console operator (all other grades)	-	5	-	13	323	-	3	-	1	-	1
Console and peripheral equipment operator	-	-	-	5	216	-	-	-	-	-	-
Peripheral equipment operator	-	-	-	1	124	-	3	-	-	-	7
Supervising peripheral equipment operator	-	-	-	1	30	-	-	-	-	-	-
Peripheral equipment operator	-	-	-	-	94	-	3	-	-	-	7
Key punch operator or data transcriber	-	1	-	-	6	5	92	5	-	-	6
Supervising key punch operator or data transcriber	-	1	-	-	2	5	18	-	-	-	-
Key punch operator	-	-	-	-	4	-	36	-	-	-	6
Data transcriber	-	-	-	-	-	-	38	5	-	-	-
Tape librarian	-	1	-	-	25	-	3	-	-	-	1
Equipment maintainer	-	-	-	-	-	-	-	-	-	2	-
Miscellaneous clerical personnel	-	-	-	-	14	-	6	-	-	-	21
Supervisor of clerical personnel	-	-	-	-	-	-	-	-	-	-	1
Secretary, stenographer, typist, receptionist	-	-	-	-	-	-	-	-	-	-	-
Clerk	-	-	-	-	14	-	6	-	-	-	20

continued

Table 6A - continued

Present occupation	Prior occupation								
	Administrative, managerial and supervisory occupations	Accountant or auditor	Engineer	Other professional occupation	Supervisor of clerical occupation	Book-keeper	Book-keeping clerk	Book-keeping machine operator	Office machine operator (other)
Total	136	48	44	124	25	9	90	378	15
Director or general supervisor	42	11	3	15	22	2	2	-	-
Systems analyst	33	14	19	52	3	-	12	2	-
Supervising systems analyst	-	1	3	4	-	-	-	-	-
Supervising systems analyst and programmer	7	-	-	4	1	-	-	-	-
Systems analyst (all other grades)	24	8	11	27	-	-	7	-	-
Systems analyst and programmer	2	5	5	17	2	-	5	2	-
Programmer	42	23	22	51	-	1	27	4	-
Supervising programmer	7	1	-	3	-	-	-	-	-
Programmer (all other grades)	34	22	22	47	-	1	25	4	-
Programmer and console operator	1	-	-	1	-	-	2	-	-
Controller or scheduler	4	-	-	1	-	4	4	55	-
Supervising controller and scheduler	4	-	-	1	-	1	-	-	-
Control clerk	-	-	-	-	-	3	4	55	-
Console operator	4	-	-	5	-	1	19	5	1
Supervising console operator	3	-	-	2	-	-	-	-	-
Console operator (all other grades)	-	-	-	3	-	1	16	5	-
Console and peripheral equipment operator	1	-	-	-	-	-	3	-	1
Peripheral equipment operator	2	-	-	-	-	1	8	28	-
Supervising peripheral equipment operator	2	-	-	-	-	-	-	6	-
Peripheral equipment operator	-	-	-	-	-	1	8	22	-
Key punch operator or data transcriber	9	-	-	-	-	-	17	268	14
Supervising key punch operator or data transcriber	9	-	-	-	-	-	3	4	-
Key punch operator	-	-	-	-	-	-	14	12	5
Data transcriber	-	-	-	-	-	-	-	252	9
Tape librarian	-	-	-	-	-	-	1	2	-
Equipment maintainer	-	-	-	-	-	-	-	-	-
Miscellaneous clerical personnel	-	-	-	-	-	-	-	14	-
Supervisor of clerical personnel	-	-	-	-	-	-	-	2	-
Secretary, stenographer, typist, receptionist	-	-	-	-	-	-	-	-	-
Clerk	-	-	-	-	-	-	-	12	-

continued

Table 6A - continued

Present occupation	Prior occupation							
	Special industry clerk				Secretary, stenographer, typist, receptionist	Other clerical occupations	Factory and processing occupations	Occupations not reporting
	Bank or other financial institution	Insurance	Public utility	Other industry				
Total	206	85	17	55	38	174	13	605
Director or general supervisor	3	-	-	-	-	-	2	67
Systems analyst	24	2	-	-	2	14	-	90
Supervising systems analyst	-	-	-	-	-	2	-	5
Supervising systems analyst and programmer	2	-	-	-	-	1	-	1
Systems analyst (all other grades)	19	1	-	-	-	2	-	50
Systems analyst and programmer	5	1	-	-	2	9	-	34
Programmer	19	35	-	14	2	43	-	101
Supervising programmer	1	-	-	-	-	1	-	10
Programmer (all other grades)	18	35	-	14	2	41	-	91
Programmer and console operator	-	-	-	-	-	1	-	-
Controller or scheduler	19	-	-	10	-	5	-	30
Supervising controller and scheduler	-	-	-	-	-	-	-	3
Control clerk	19	-	-	10	-	5	-	27
Console operator	13	4	-	10	3	26	5	56
Supervising console operator	-	-	-	-	-	3	-	9
Console operator (all other grades)	13	4	-	10	3	22	5	43
Console and peripheral equipment operator	-	-	-	-	-	1	-	4
Peripheral equipment operator	10	10	8	-	1	23	-	54
Supervising peripheral equipment operator	-	-	-	-	-	-	-	3
Peripheral equipment operator	10	10	8	-	1	23	-	51
Key punch operator or data transcriber	90	28	4	3	28	40	6	119
Supervising key punch operator or data transcriber	-	-	-	-	1	1	-	45
Key punch operator	39	28	-	3	23	36	-	57
Data transcriber	51	-	4	-	4	3	6	17
Tape librarian	2	1	-	-	1	6	-	18
Equipment maintainer	-	1	-	-	-	-	-	-
Miscellaneous clerical personnel	26	4	5	18	1	17	-	70
Supervisor of clerical personnel	-	-	-	-	-	-	-	-
Secretary, stenographer, typist, receptionist	-	-	-	-	1	-	-	2
Clerk	26	4	5	18	-	17	-	68

Table 6. PRESENT AND PRIOR OCCUPATION OF PERSONNEL REASSIGNED TO ELECTRONIC DATA-PROCESSING INSTALLATIONS:

B. New data-processing installation

Present occupation	Total	Prior occupation								
		Total reporting prior occupation	Administrative, managerial and supervisory occupations	Accountant or auditor	Engineer	Other professional occupation	Supervisor of clerical occupation	Bookkeeper	Bookkeeping clerk	Bookkeeping machine operator
Total	703	573	36	4	17	41	22	7	18	340
Director or general supervisor	54	41	6	4	1	5	22	1	-	-
Systems analyst	38	35	7	-	4	14	-	-	3	2
Supervising systems analyst	-	-	-	-	-	-	-	-	-	-
Supervising systems analyst and programmer	-	-	-	-	-	-	-	-	-	-
Systems analyst (all other grades)	22	19	5	-	2	12	-	-	-	-
Systems analyst and programmer	16	16	2	-	2	2	-	-	3	2
Programmer	91	67	23	-	12	19	-	-	2	-
Supervising programmer	8	7	5	-	-	1	-	-	-	-
Programmer (all other grades)	83	60	18	-	12	18	-	-	2	-
Programmer and console operator	-	-	-	-	-	-	-	-	-	-
Controller or scheduler	49	47	-	-	-	-	-	4	-	38
Supervising controller and scheduler	1	1	-	-	-	-	-	1	-	-
Control clerk	48	46	-	-	-	-	-	3	-	38
Console operator	46	39	-	-	-	3	-	1	7	5
Supervising console operator	1	1	-	-	-	1	-	-	-	-
Console operator (all other grades)	44	38	-	-	-	2	-	1	7	5
Console and peripheral equipment operator	1	-	-	-	-	-	-	-	-	-
Peripheral equipment operator	65	44	-	-	-	-	-	1	1	22
Supervising peripheral equipment operator	6	6	-	-	-	-	-	-	-	6
Peripheral equipment operator	59	38	-	-	-	-	-	1	1	16
Key punch operator or data transcriber	326	284	-	-	-	-	-	-	5	257
Supervising key punch operator or data transcriber	38	6	-	-	-	-	-	-	1	4
Key punch operator	40	30	-	-	-	-	-	-	4	7
Data transcriber	248	248	-	-	-	-	-	-	-	246
Tape librarian	6	2	-	-	-	-	-	-	-	2
Equipment maintainer	-	-	-	-	-	-	-	-	-	-
Miscellaneous clerical personnel	28	14	-	-	-	-	-	-	-	14
Supervisor of clerical personnel	2	2	-	-	-	-	-	-	-	2
Secretary, stenographer, typist, receptionist	-	-	-	-	-	-	-	-	-	-
Clerk	26	12	-	-	-	-	-	-	-	12

Continued

Table 6B - continued

Present occupation	Prior occupation							
	Special industry clerk				Secretary, stenographer, typist, receptionist	Other clerical occupation	Factory and processing occupations	Occupations not reporting
	Bank or other financial institution	Insurance	Public utility	Other industry				
Total	19	-	-	13	15	41	-	130
Director or general supervisor	2	-	-	-	-	-	-	13
Systems analyst	5	-	-	-	-	-	-	3
Supervising systems analyst	-	-	-	-	-	-	-	-
Supervising systems analyst and programmer	-	-	-	-	-	-	-	-
Systems analyst (all other grades)	-	-	-	-	-	-	-	3
Systems analyst and programmer	5	-	-	-	-	-	-	-
Programmer	3	-	-	3	1	4	-	24
Supervising programmer	1	-	-	-	-	-	-	1
Programmer (all other grades)	2	-	-	3	1	4	-	23
Programmer and console operator	-	-	-	-	-	-	-	-
Controller or scheduler	5	-	-	-	-	-	-	2
Supervising controller and scheduler	-	-	-	-	-	-	-	-
Control clerk	5	-	-	-	-	-	-	2
Console operator	2	-	-	10	2	9	-	7
Supervising console operator	-	-	-	-	-	-	-	-
Console operator (all other grades)	2	-	-	10	2	9	-	6
Console and peripheral equipment operator	-	-	-	-	-	-	-	1
Peripheral equipment operator	2	-	-	-	1	17	-	21
Supervising peripheral equipment operator	-	-	-	-	-	-	-	-
Peripheral equipment operator	2	-	-	-	1	17	-	21
Key punch operator or data transcriber	-	-	-	-	11	11	-	42
Supervising key punch operator or data transcriber	-	-	-	-	1	-	-	32
Key punch operator	-	-	-	-	8	11	-	10
Data transcriber	-	-	-	-	2	-	-	-
Tape librarian	-	-	-	-	-	-	-	4
Equipment maintainer	-	-	-	-	-	-	-	-
Miscellaneous clerical personnel	-	-	-	-	-	-	-	14
Supervisor of clerical personnel	-	-	-	-	-	-	-	-
Secretary, stenographer, typist, receptionist	-	-	-	-	-	-	-	-
Clerk	-	-	-	-	-	-	-	14

Table 6. PRESENT AND PRIOR OCCUPATION OF PERSONNEL REASSIGNED TO ELECTRONIC DATA-PROCESSING INSTALLATIONS:

C. Addition to or replacement of EAM installation

Present occupation	Total	Total reporting prior occupation	Prior occupation							
			Director, or general supervisor	Supervising systems analyst	Systems analyst (all other grades)	Supervising controller or scheduler	Control clerk	Supervising peripheral equipment operator	Peripheral equipment operator	Supervising key punch operator or data transcriber
Total	2,184	1,894	235	4	102	10	7	97	708	3
Director or general supervisor	328	299	210	-	13	10	-	15	9	-
Systems analyst	254	203	6	4	66	-	-	2	20	-
Supervising systems analyst	20	18	2	4	2	-	-	-	-	-
Supervising systems analyst and programmer	9	8	-	-	-	-	-	-	1	-
Systems analyst (all other grades)	131	117	3	-	50	-	-	1	12	-
Systems analyst and programmer	94	60	1	-	14	-	-	1	7	-
Programmer	452	401	13	-	21	-	-	25	144	-
Supervising programmer	20	11	1	-	-	-	-	3	2	-
Programmer (all other grades)	426	384	12	-	21	-	-	22	140	-
Programmer and console operator	6	6	-	-	-	-	-	-	2	-
Controller or scheduler	61	38	-	-	-	-	3	-	5	-
Supervising controller and scheduler	5	2	-	-	-	-	-	-	-	-
Control clerk	56	36	-	-	-	-	3	-	5	-
Console operator	568	533	3	-	2	-	-	54	439	-
Supervising console operator	60	54	3	-	1	-	-	37	12	-
Console operator (all other grades)	282	256	-	-	1	-	-	12	215	-
Console and peripheral equipment operator	226	223	-	-	-	-	-	5	212	-
Peripheral equipment operator	124	99	3	-	-	-	3	1	53	-
Supervising peripheral equipment operator	28	25	3	-	-	-	-	1	21	-
Peripheral equipment operator	96	74	-	-	-	-	3	-	32	-
Key punch operator or data transcriber	258	203	-	-	-	-	-	-	5	3
Supervising key punch operator or data transcriber	22	12	-	-	-	-	-	-	1	3
Key punch operator	157	129	-	-	-	-	-	-	4	-
Data transcriber	79	62	-	-	-	-	-	-	-	-
Tape librarian	44	34	-	-	-	-	1	-	19	-
Equipment maintainer	2	2	-	-	-	-	-	-	-	-
Miscellaneous clerical personnel	93	82	-	-	-	-	-	-	14	-
Supervisor of clerical personnel	-	-	-	-	-	-	-	-	-	-
Secretary, stenographer, typist, receptionist	1	-	-	-	-	-	-	-	-	-
Clerk	92	82	-	-	-	-	-	-	14	-

Continued

Table 6C - continued

Present occupation	Prior occupation (continued)											
	Key punch operator	Data transcriber	Equipment maintainer	Clerk	Administrative, managerial and supervisory occupations	Accountant or auditor	Engineer	Other professional occupation	Supervisor of clerical occupation	Bookkeeper	Bookkeeping clerk	Bookkeeping machine operator
Total	68	5	2	36	56	43	21	74	3	2	61	21
Director or general supervisor	-	-	-	-	21	7	2	6	-	1	2	-
Systems analyst	-	-	-	-	14	14	13	37	3	-	7	-
Supervising systems analyst	-	-	-	-	-	1	3	4	-	-	-	-
Supervising systems analyst and programmer	-	-	-	-	1	-	-	4	1	-	-	-
Systems analyst (all other grades)	-	-	-	-	13	8	7	14	-	-	6	-
Systems analyst and programmer	-	-	-	-	-	5	3	15	2	-	1	-
Programmer	2	-	-	1	18	22	6	29	-	1	23	4
Supervising programmer	-	-	-	-	1	1	-	2	-	-	-	-
Programmer (all other grades)	2	-	-	1	16	21	6	27	-	1	21	4
Programmer and console operator	-	-	-	-	1	-	-	-	-	-	2	-
Controller or scheduler	7	-	-	2	1	-	-	1	-	-	3	-
Supervising controller and scheduler	-	-	-	-	1	-	-	1	-	-	-	-
Control clerk	7	-	-	2	-	-	-	-	-	-	3	-
Console operator	1	-	-	-	2	-	-	1	-	-	10	-
Supervising console operator	-	-	-	-	1	-	-	-	-	-	-	-
Console operator (all other grades)	1	-	-	-	-	-	-	1	-	-	7	-
Console and peripheral equipment operator	-	-	-	-	1	-	-	-	-	-	3	-
Peripheral equipment operator	2	-	-	7	-	-	-	-	-	-	7	6
Supervising peripheral equipment operator	-	-	-	-	-	-	-	-	-	-	-	-
Peripheral equipment operator	2	-	-	7	-	-	-	-	-	-	7	6
Key punch operator or data transcriber	47	5	-	6	-	-	-	-	-	-	8	11
Supervising key punch operator or data transcriber	7	-	-	-	-	-	-	-	-	-	1	-
Key punch operator	2	-	-	6	-	-	-	-	-	-	7	5
Data transcriber	38	5	-	-	-	-	-	-	-	-	-	6
Tape librarian	3	-	-	1	-	-	-	-	-	-	1	-
Equipment maintainer	-	-	2	-	-	-	-	-	-	-	-	-
Miscellaneous clerical personnel	6	-	-	19	-	-	-	-	-	-	-	-
Supervisor of clerical personnel	-	-	-	-	-	-	-	-	-	-	-	-
Secretary, stenographer, typist, receptionist	-	-	-	-	-	-	-	-	-	-	-	-
Clerk	6	-	-	19	-	-	-	-	-	-	-	-

continued

Table 6C - continued

Present occupation	Prior occupation								
	Office machine operator (other)	Special industry clerk				Secretary, stenographer, typist, receptionist	Other clerical occupations	Factory and processing occupations	Occupations not reporting
		Bank or other financial institution	Insurance	Public utility	Other industry				
Total	6	60	67	17	41	10	128	7	290
Director or general supervisor	-	1	-	-	-	-	-	2	29
Systems analyst	-	-	1	-	-	2	14	-	51
Supervising systems analyst	-	-	-	-	-	-	2	-	2
Supervising systems analyst and programmer	-	-	-	-	-	-	1	-	1
Systems analyst (all other grades)	-	-	1	-	-	-	2	-	14
Systems analyst and programmer	-	-	-	-	-	2	9	-	34
Programmer	-	10	35	-	10	1	36	-	51
Supervising programmer	-	-	-	-	-	-	1	-	9
Programmer (all other grades)	-	10	35	-	10	1	34	-	42
Programmer and console operator	-	-	-	-	-	-	1	-	-
Controller or scheduler	-	1	-	-	10	-	5	-	23
Supervising controller and scheduler	-	-	-	-	-	-	-	-	3
Control clerk	-	1	-	-	10	-	5	-	20
Console operator	1	4	-	-	-	1	10	5	35
Supervising console operator	-	-	-	-	-	-	-	-	6
Console operator (all other grades)	-	4	-	-	-	1	9	5	26
Console and peripheral equipment operator	1	-	-	-	-	-	1	-	3
Peripheral equipment operator	-	3	-	8	-	-	6	-	25
Supervising peripheral equipment operator	-	-	-	-	-	-	-	-	3
Peripheral equipment operator	-	3	-	8	-	-	6	-	22
Key punch operator or data transcriber	5	39	28	4	3	5	34	-	55
Supervising key punch operator or data transcriber	-	-	-	-	-	-	-	-	10
Key punch operator	5	39	28	-	3	5	25	-	28
Data transcriber	-	-	-	4	-	-	9	-	17
Tape librarian	-	2	-	-	-	1	6	-	10
Equipment maintainer	-	-	-	-	-	-	-	-	-
Miscellaneous clerical personnel	-	-	3	5	18	-	17	-	11
Supervisor of clerical personnel	-	-	-	-	-	-	-	-	-
Secretary, stenographer, typist, receptionist	-	-	-	-	-	-	-	-	1
Clerk	-	-	3	5	18	-	17	-	10

Table 6. PRESENT AND PRIOR OCCUPATION OF PERSONNEL REASSIGNED TO ELECTRONIC DATA-PROCESSING INSTALLATIONS:

D. Updated computer

Present occupation	Total	Total reporting prior occupation	Prior occupation: Director or general supervisor	Supervising systems analyst	Systems analyst (all other grades)	Systems analyst and programmer	Supervising programmer	Programmer (all other grades)	Programmer and console operator	Supervising controller or scheduler	Control clerk
Total	834	649	9	2	12	4	1	7	1	1	1
Director or general supervisor	63	38	7	1	-	1	1	1	-	-	-
Systems analyst	97	61	2	1	8	3	-	1	-	-	-
Supervising systems analyst	4	1	-	-	1	-	-	-	-	-	-
Supervising systems analyst and programmer	7	7	-	1	-	-	-	-	-	-	-
Systems analyst (all other grades)	77	44	1	-	6	3	-	1	-	-	-
Systems analyst and programmer	9	9	1	-	1	-	-	-	-	-	-
Programmer	119	93	-	-	4	-	-	5	1	-	-
Supervising programmer	6	6	-	-	-	-	-	2	-	-	-
Programmer (all other grades)	111	85	-	-	4	-	-	3	-	-	-
Programmer and console operator	2	2	-	-	-	-	-	-	1	-	-
Controller or scheduler	42	37	-	-	-	-	-	-	-	-	-
Supervising controller and scheduler	5	5	-	-	-	-	-	-	-	-	-
Control clerk	37	32	-	-	-	-	-	-	-	-	-
Console operator	169	155	-	-	-	-	-	-	-	-	-
Supervising console operator	19	16	-	-	-	-	-	-	-	-	-
Console operator (all other grades)	146	135	-	-	-	-	-	-	-	-	-
Console and peripheral equipment operator	4	4	-	-	-	-	-	-	-	-	-
Peripheral equipment operator	97	89	-	-	-	-	-	-	-	-	-
Supervising peripheral equipment operator	11	11	-	-	-	-	-	-	-	-	-
Peripheral equipment operator	86	78	-	-	-	-	-	-	-	-	-
Key punch operator or data transcriber	158	136	-	-	-	-	-	-	-	1	-
Supervising key punch operator or data transcriber	30	27	-	-	-	-	-	-	-	1	-
Key punch operator	66	47	-	-	-	-	-	-	-	-	-
Data transcriber	62	62	-	-	-	-	-	-	-	-	-
Tape librarian	13	9	-	-	-	-	-	-	-	-	1
Equipment maintainer	1	1	-	-	-	-	-	-	-	-	-
Miscellaneous clerical personnel	75	30	-	-	-	-	-	-	-	-	-
Supervisor of clerical personnel	1	1	-	-	-	-	-	-	-	-	-
Secretary, stenographer, typist,receptionist	2	1	-	-	-	-	-	-	-	-	-
Clerk	72	28	-	-	-	-	-	-	-	-	-

Continued

Table 6D - continued

Present occupation	Prior occupation								
	Adminis-trative, manager-ial and super-visory occupa-tions	Accoun-tant or auditor	Engineer	Other profes-sional occupa-tion	Super-visor of clerical occupa-tion	Book-keeper	Book-keeping clerk	Book-keeping machine operator	Office machine operator (other)
Total	44	1	6	9	-	-	11	17	9
Director or general supervisor	15	-	-	4	-	-	-	-	-
Systems analyst	12	-	2	1	-	-	2	-	-
Supervising systems analyst	-	-	-	-	-	-	-	-	-
Supervising systems analyst and programmer	6	-	-	-	-	-	-	-	-
Systems analyst (all other grades)	6	-	2	1	-	-	1	-	-
Systems analyst and programmer	-	-	-	-	-	-	1	-	-
Programmer	1	1	4	3	-	-	2	-	-
Supervising programmer	1	-	-	-	-	-	-	-	-
Programmer (all other grades)	-	1	4	2	-	-	2	-	-
Programmer and console operator	-	-	-	1	-	-	-	-	-
Controller or scheduler	3	-	-	-	-	-	1	17	-
Supervising controller and scheduler	3	-	-	-	-	-	-	-	-
Control clerk	-	-	-	-	-	-	1	17	-
Console operator	2	-	-	1	-	-	2	-	-
Supervising console operator	2	-	-	1	-	-	-	-	-
Console operator (all other grades)	-	-	-	-	-	-	2	-	-
Console and peripheral equipment operator	-	-	-	-	-	-	-	-	-
Peripheral equipment operator	2	-	-	-	-	-	-	-	-
Supervising peripheral equipment operator	2	-	-	-	-	-	-	-	-
Peripheral equipment operator	-	-	-	-	-	-	-	-	-
Key punch operator or data transcriber	9	-	-	-	-	-	4	-	9
Supervising key punch operator or data transcriber	9	-	-	-	-	-	1	-	-
Key punch operator	-	-	-	-	-	-	3	-	-
Data transcriber	-	-	-	-	-	-	-	-	9
Tape librarian	-	-	-	-	-	-	-	-	-
Equipment maintainer	-	-	-	-	-	-	-	-	-
Miscellaneous clerical personnel	-	-	-	-	-	-	-	-	-
Supervisor of clerical personnel	-	-	-	-	-	-	-	-	-
Secretary, stenographer, typist, receptionist	-	-	-	-	-	-	-	-	-
Clerk	-	-	-	-	-	-	-	-	-

Continued

Table 6D - continued

Present occupation	Prior occupation (continued)										
	Supervising console operator	Console operator (all other grades)	Console and peripheral equipment operator	Supervising peripheral equipment operator	Peripheral equipment operator	Supervising key punch operator or data transcriber	Key punch operator	Data transcriber	Tape librarian	Equipment maintainer	Clerk
Total	1	16	2	9	262	2	48	-	1	-	3
Director or general supervisor	-	-	2	1	5	-	-	-	-	-	-
Systems analyst	-	-	-	2	7	-	-	-	-	-	-
Supervising systems analyst	-	-	-	-	-	-	-	-	-	-	-
Supervising systems analyst and programmer	-	-	-	-	-	-	-	-	-	-	-
Systems analyst (all other grades)	-	-	-	1	3	-	-	-	-	-	-
Systems analyst and programmer	-	-	-	1	4	-	-	-	-	-	-
Programmer	1	6	-	2	53	-	-	-	-	-	-
Supervising programmer	-	-	-	1	2	-	-	-	-	-	-
Programmer (all other grades)	1	6	-	1	51	-	-	-	-	-	-
Programmer and console operator	-	-	-	-	-	-	-	-	-	-	-
Controller or scheduler	-	-	-	2	1	-	-	-	-	-	-
Supervising controller and scheduler	-	-	-	2	-	-	-	-	-	-	-
Control clerk	-	-	-	-	1	-	-	-	-	-	-
Console operator	-	8	-	2	118	-	2	-	1	-	1
Supervising console operator	-	3	-	1	6	-	-	-	-	-	-
Console operator (all other grades)	-	5	-	1	108	-	2	-	1	-	1
Console and peripheral equipment operator	-	-	-	-	4	-	-	-	-	-	-
Peripheral equipment operator	-	-	-	-	71	-	1	-	-	-	-
Supervising peripheral equipment operator	-	-	-	-	9	-	-	-	-	-	-
Peripheral equipment operator	-	-	-	-	62	-	1	-	-	-	-
Key punch operator or data transcriber	-	1	-	-	1	2	45	-	-	-	-
Supervising key punch operator or data transcriber	-	1	-	-	1	2	11	-	-	-	-
Key punch operator	-	-	-	-	-	-	34	-	-	-	-
Data transcriber	-	-	-	-	-	-	-	-	-	-	-
Tape librarian	-	1	-	-	6	-	-	-	-	-	-
Equipment maintainer	-	-	-	-	-	-	-	-	-	-	-
Miscellaneous clerical personnel	-	-	-	-	-	-	-	-	-	-	2
Supervisor of clerical personnel	-	-	-	-	-	-	-	-	-	-	1
Secretary,stenographer,typist,receptionist	-	-	-	-	-	-	-	-	-	-	-
Clerk	-	-	-	-	-	-	-	-	-	-	1

Continued

Table 6D - continued

Present occupation	Prior occupation (continued)							
	Special industry clerk				Secretary, stenographer, typist, receptionist	Other clerical occupations	Factory and processing occupations	Occupations not reporting
	Bank or other financial institution	Insurance	Public utility	Other industry				
Total	127	18	-	1	13	11	-	185
Director or general supervisor	-	-	-	-	-	-	-	25
Systems analyst	19	1	-	-	-	-	-	36
Supervising systems analyst	-	-	-	-	-	-	-	3
Supervising systems analyst and programmer	-	-	-	-	-	-	-	-
Systems analyst (all other grades)	19	-	-	-	-	-	-	33
Systems analyst and programmer	-	1	-	-	-	-	-	-
Programmer	6	-	-	1	-	3	-	26
Supervising programmer	-	-	-	-	-	-	-	-
Programmer (all other grades)	6	-	-	1	-	3	-	26
Programmer and console operator	-	-	-	-	-	-	-	-
Controller or scheduler	13	-	-	-	-	-	-	5
Supervising controller and scheduler	-	-	-	-	-	-	-	-
Control clerk	13	-	-	-	-	-	-	5
Console operator	7	4	-	-	-	7	-	14
Supervising console operator	-	-	-	-	-	3	-	3
Console operator (all other grades)	7	4	-	-	-	4	-	11
Console and peripheral equipment operator	-	-	-	-	-	-	-	-
Peripheral equipment operator	5	10	-	-	-	-	-	8
Supervising peripheral equipment operator	-	-	-	-	-	-	-	-
Peripheral equipment operator	5	10	-	-	-	-	-	8
Key punch operator or data transcriber	51	-	-	-	12	1	-	22
Supervising key punch operator or data transcriber	-	-	-	-	-	1	-	3
Key punch operator	-	-	-	-	10	-	-	19
Data transcriber	51	-	-	-	2	-	-	-
Tape librarian	-	1	-	-	-	-	-	4
Equipment maintainer	-	1	-	-	-	-	-	-
Miscellaneous clerical personnel	26	1	-	-	1	-	-	45
Supervisor of clerical personnel	-	-	-	-	-	-	-	-
Secretary, stenographer, typist, receptionist	-	-	-	-	1	-	-	1
Clerk	26	1	-	-	-	-	-	44

Table 7. REASSIGNED AND NEWLY HIRED WORKERS WHO WERE TRAINED: DISTRIBUTION BY OCCUPATION FOR WHICH TRAINING WAS PROVIDED

Occupation for which training was provided	Total reassigned and newly hired workers trained			Reassigned workers trained			Newly hired workers trained		
	IN EDP unit	Formal training provided	Per- cent	In EDP unit	Formal training provided	Per- cent	In EDP unit	Formal training provided	Per- cent
Total	7,064	2,606	36.9	3,721	1,984	53.3	3,343	622	18.6
Director or general supervisor	523	267	51.1	445	246	55.3	78	21	26.9
Systems analyst	560	427	76.3	389	350	90.0	171	77	45.0
Supervising systems analyst	34	21	61.8	24	20	83.3	10	1	10.0
Supervising systems analyst and programmer	21	14	66.7	16	12	75.0	5	2	40.0
Systems analyst (all other grades)	337	240	71.2	230	199	86.5	107	41	38.3
Systems analyst and programmer	168	152	90.5	119	119	100.0	49	33	67.3
Programmer	1,181	953	80.7	662	657	99.2	519	296	57.0
Supervising programmer	56	39	69.6	34	31	91.2	22	8	36.4
Programmer (all other grades)	1,115	908	81.4	620	620	100.0	495	288	58.2
Programmer and console operator	10	6	60.0	8	6	75.0	2	-	-
Controller or scheduler	235	1	(a)	152	1	(a)	83	-	-
Supervising controller or scheduler	13	-	-	11	-	-	2	-	-
Control clerk	222	1	(a)	141	1	(a)	81	-	-
Console operator	1,015	595	58.6	783	546	69.7	232	49	21.1
Supervising console operator	96	62	64.6	80	58	72.5	16	4	25.0
Console operator (all other grades)	647	424	65.5	472	384	81.4	175	40	22.9
Console and peripheral equipment operator	272	109	40.1	231	104	45.0	41	5	12.2
Peripheral equipment operator	670	87	13.0	286	68	23.8	384	19	49.5
Supervising peripheral equipment operator	63	8	12.7	45	8	17.8	18	-	-
Peripheral equipment operator	607	79	13.0	241	60	24.9	366	19	51.9
Key punch operator or data transcriber	2,313	256	11.1	742	99	13.3	1,571	157	10.0
Supervising key punch operator or data transcriber	114	1	(a)	90	1	1.1	24	-	-
Key punch operator	1,570	234	14.9	263	82	31.2	1,307	152	11.6
Data transcriber	629	21	3.3	389	16	41.1	240	5	2.1
Tape librarian	79	12	15.2	63	12	19.0	16	-	-
Equipment maintainer	28	6	21.4	3	3	100.0	25	3	12.0
Miscellaneous clerical personnel	460	2	(a)	196	2	1.0	264	-	-
Supervisor of clerical personnel	4	-	-	3	-	-	1	-	-
Secretary, stenographer, typist, receptionist	30	-	-	3	-	-	27	-	-
Clerk	426	2	(a)	190	2	1.1	236	-	-

a. Less than one-half of 1 percent.

Table 8. REASSIGNED WORKERS WHO WERE TRAINED BY PREVIOUS OCCUPATION AND BY OCCUPATION FOR WHICH TRAINING WAS PROVIDED

A. Director or general supervisor

Previous occupation	Total workers	Occupation for which training was provided		
		Director, or manager, EDP installation	Director or manager and systems analyst	Director or manager and programmer
Total	246	202	5	39
Total reporting	234	190	5	39
Data-processing occupations	173	137	4	32
Director or manager, EAM installation	118	96	3	19
Director or manager, EDP installation	15	15	-	-
Director or manager and programmer	10	-	-	10
Systems analyst	12	11	1	-
Systems analyst and programmer	1	1	-	-
Supervising scheduler	1	1	-	-
Supervising peripheral equipment operator	11	8	-	3
Peripheral equipment operator	5	5	-	-
Other occupations	61	53	1	7
Administrative, managerial or supervisory occupations	34	34	-	-
Accountant or auditor	9	3	1	5
Other professional occupations	11	11	-	-
Supervisor of clerical occupations	1	-	-	1
Bookkeeper	2	1	-	1
Bookkeeping clerk	1	1	-	-
Special industry clerk: Bank or financial institution	3	3	-	-
Not reporting	12	12	-	-

Table 8. REASSIGNED WORKERS WHO WERE TRAINED, BY PREVIOUS OCCUPATION AND BY OCCUPATION FOR WHICH TRAINING WAS PROVIDED

B. Systems analyst

Previous occupation	Total workers	Occupation for which training was provided			
		Supervising systems analyst	Supervising systems analyst and programmer	Systems analyst	Systems analyst and programmer
Total	350	20	199	12	119
Total reporting	322	18	173	12	119
Data processing occupations	179	14	97	4	64
Director or manager, EAM installation	7	2	3	-	2
Director or manager, EDP installation	2	-	2	-	-
Supervising systems analyst, EAM installation	4	3	-	1	-
Systems analyst, EAM installation	58	3	39	-	16
Supervising systems analyst, EDP installation	4	4	-	-	-
Supervising systems analyst and programmer	2	-	-	2	-
Systems analyst (all other grades)	31	1	30	-	-
Systems analyst and programmer	39	-	3	-	36
Console operator	2	-	2	-	-
Supervising peripheral equipment operator	6	1	3	-	2
Peripheral equipment operator	24	-	15	1	8
Other occupations	143	4	76	8	55
Administrative, managerial or supervisory occupation	27	-	20	2	5
Accountant or auditor	11	-	6	-	5
Engineer	15	2	8	-	5
Other professional occupation	50	1	28	4	17
Bookkeeping clerk	15	-	11	-	4
Office machine operator (bookkeeping machine)	2	-	-	-	2
Special industry clerk:					
Bank or other financial institution	5	-	-	-	5
Insurance	2	-	1	-	1
Secretary, steno, typist, or receptionist	2	-	-	-	2
Other clerical occupations	14	1	2	2	9
Not reporting	28	2	26	-	-

Table 8. REASSIGNED WORKERS WHO WERE TRAINED,BY PREVIOUS OCCUPATION AND BY OCCUPATION FOR WHICH TRAINING WAS PROVIDED

C. Programmer

Previous occupation	Total workers	Occupation for which training was provided		
		Supervising programmer	Programmer (all other grades)	Programmer and console operator
Total	657	31	620	6
Total reporting	651	25	620	6
Data processing occupations	370	9	359	2
Director or manager,EAM installation	12	1	11	-
Systems analyst,EAM installation	23	-	23	-
Systems analyst,EDP installation	2	-	2	-
Supervising programmer	2	2	-	-
Programmer (all other grades)	90	1	89	-
Programmer and console operator	1	-	-	1
Console operator (all other grades)	5	-	5	-
Console and peripheral equipment operator	1	-	1	-
Supervising peripheral equipment operator	28	3	25	-
Peripheral equipment operator	204	2	201	1
Key punch operator	2	-	2	-
Other occupations	281	16	261	4
Administrative, managerial, or supervisory occupation	28	7	20	1
Accountant or auditor	18	1	17	-
Engineer	15	-	15	-
Other professional occupation	57	5	52	-
Bookkeeper	1	-	1	-
Bookkeeping clerk	29	1	26	2
Office machine operator (bookkeeping machine)	4	-	4	-
Special industry clerk:				
Bank or other financial institution	41	1	40	-
Insurance	35	-	35	-
Other industry	11	-	11	-
Secretary, steno, typist or receptionist	3	-	3	-
Other clerical occupation	39	1	37	1
Not reporting	6	6	-	-

Table 8. REASSIGNED WORKERS WHO WERE TRAINED,BY PREVIOUS OCCUPATION AND BY OCCUPATION FOR WHICH TRAINING WAS PROVIDED

D. Console operator

Previous occupation	Total workers	Occupation for which training was provided: Supervising console operator	Supervising console and peripheral equipment operator	Console operator (all other grades)	Console and peripheral equipment operator
Total	546	27	31	384	104
Total reporting	530	27	29	376	98
Data processing occupations	460	20	29	318	93
Director or manager,EAM installation	2	-	2	-	-
Systems analyst,EAM installation	1	-	-	-	1
Supervising console operator	3	3	-	-	-
Console operator (all other grades)	37	3	-	34	-
Console and peripheral equipment operator	5	-	-	-	5
Supervising peripheral equipment operator	33	9	15	9	-
Peripheral equipment operator	375	5	12	271	87
Key punch operator	3	-	-	3	-
Tape librarian	1	-	-	1	-
Other occupations	70	7	-	58	5
Administrative, managerial or supervisory occupation	2	2	-	-	-
Other professional occupation	5	2	-	3	-
Bookkeeper	1	-	-	1	-
Bookkeeping clerk	13	-	-	10	3
Office machine operator (other)	1	-	-	-	1
Special industry clerk:					
Bank or other financial institution	10	-	-	10	-
Other industry	6	-	-	6	-
Secretary,stenographer, typist or receptionist	1	-	-	1	-
Other clerical occupation	26	3	-	22	1
Factory and processing occupation	5	-	-	5	-
Not reporting	16	-	2	8	6

Table 8. REASSIGNED WORKERS WHO WERE TRAINED BY PREVIOUS OCCUPATION AND BY OCCUPATION FOR WHICH TRAINING WAS PROVIDED

E. Other occupations

Previous occupations	Total workers	Occupation for which training was provided						
		Supervising peripheral equipment operator	Peripheral equipment operator	Supervising key punch operator	Key punch operator	Data transcriber	Tape librarian	All other occupations
Total	185	8	60	1	82	16	12	6
Total reporting	184	8	59	1	82	16	12	6
Data processing occupations	76	8	45	-	4	4	12	3
Supervising peripheral equipment operator	6	6	-	-	-	-	-	-
Peripheral equipment operator	55	2	43	-	-	-	10	-
Key punch operator	5	-	1	-	-	4	-	-
Equipment maintainer	3	-	-	-	-	-	-	3
Secretary, stenographer, typist, or receptionist	1	-	-	-	-	-	1	-
Clerk	6	-	1	-	4	-	1	-
Other occupations	188	-	14	1	78	12	-	3
Bookkeeping clerk	15	-	8	1	5	-	-	1
Office machine operator (bookkeeping machine)	22	-	-	-	16	6	-	-
Special industry clerk:								
Bank or financial institution	38	-	-	-	-	-	-	1
Insurance	1	-	-	-	-	-	-	1
Secretary, stenographer, typist, receptionist	8	-	1	-	7	-	-	-
Other clerical occupations	24	-	5	-	12	6	-	1
Not reporting	1	-	1	-	-	-	-	-

Table 9. REASSIGNED AND NEWLY HIRED WORKERS FOR WHOM TRAINING WAS PROVIDED, BY OCCUPATION FOR WHICH TRAINED: DISTRIBUTION BY RELATION TO PRESENT TO PREVIOUS EQUIPMENT

Occupation for which trained	Total	Relation to previous equipment		
		New data-processing installation	Addition to or replacement of EAM installation	Updated computer
Total	2,606	274	1,651	681
Director or general supervisor	267	33	196	38
Systems analyst	427	31	279	117
Supervising systems analyst	21	-	15	6
Supervising systems analyst and programmer	14	-	11	3
Systems analyst (all other grades)	240	17	158	65
Systems analyst and programmer	152	14	95	43
Programmer	953	125	559	269
Supervising programmer	39	10	20	9
Programmer (all other grades)	908	115	534	259
Programmer and console operator	6	-	5	1
Controller or scheduler	1	-	1	-
Supervising controller and scheduler	-	-	-	-
Control clerk	1	-	1	-
Console operator	595	52	360	183
Supervising console operator	62	5	39	18
Console operator (all other grades)	424	44	221	159
Console and peripheral equipment operator	109	3	100	6
Peripheral equipment operator	87	9	38	40
Supervising peripheral equipment operator	8	-	3	5
Peripheral equipment operator	79	9	35	35
Key punch operator or data transcriber	256	24	202	30
Supervising key punch operator or data transcriber	1	1	-	-
Key punch operator	234	23	181	30
Data transcriber	21	-	21	-
Tape librarian	12	-	10	2
Equipment maintainer	7	-	5	2
Miscellaneous clerical personnel	1	-	1	-
Supervisor of clerical personnel	-	-	-	-
Secretary,stenographer,typist,receptionist	-	-	-	-
Clerk	1	-	1	-

Table 10. DURATION OF FORMAL TRAINING FOR WORKERS REASSIGNED TO HIGHER SKILL LEVEL JOBS BY OCCUPATION FOR WHICH TRAINING WAS PROVIDED AND PREVIOUS OCCUPATION

Occupation for which training was provided	Total workers	Total workers for whom duration of training was reported	Duration of training: Less than 1 week	1 or 2 weeks	3 or 4 weeks	5 or 6 weeks	7 or 8 weeks	More than 8 weeks	Duration of training not reported
Total	1,110	943	74	309	259	243	43	15	167
Director or general supervisor									
Total	50	43	3	20	11	8	1	-	7
Director or general supervisor	34	28	1	15	5	7	-	-	6
Supervising systems analyst	2	2	-	2	-	-	-	-	-
Systems analyst (all other grades)	4	4	-	1	3	-	-	-	-
Systems analyst and programmer	1	1	-	-	-	-	1	-	-
Supervising programmer	1	1	-	1	-	-	-	-	-
Programmer (all other grades)	6	5	-	1	3	1	-	-	1
Supervising console operator	2	2	2	-	-	-	-	-	-
Systems analyst									
Total	32	18	-	2	11	4	1	-	14
Director or general supervisor	12	4	-	2	2	-	-	-	8
Supervising systems analyst	4	1	-	-	1	-	-	-	3
Systems analyst and programmer	7	7	-	-	5	1	1	-	-
Programmer (all other grades)	9	6	-	-	3	3	-	-	3
Console operator									
Total	11	3	-	1	2	-	-	-	8
Systems analyst (all other grades)	2	-	-	-	-	-	-	-	2
Programmer (all other grades)	6	2	-	1	1	-	-	-	4
Supervising console operator	3	1	-	-	1	-	-	-	2
Peripheral equipment operator									
Total	650	561	53	217	145	122	9	15	89
Director or general supervisor	12	10	-	-	7	3	-	-	2
Supervising systems analyst and programmer	1	1	-	-	1	-	-	-	-
Systems analyst (all other grades)	12	12	-	3	7	2	-	-	-
Systems analyst and programmer	10	9	-	1	6	2	-	-	1
Supervising programmer	5	5	-	-	3	1	-	1	-
Programmer (all other grades)	206	195	-	52	63	59	7	14	11
Programmer and console operator	1	1	-	1	-	-	-	-	-
Supervising console operator	38	36	6	20	10	-	-	-	2
Console operator (all other grades)	277	205	32	71	45	55	2	-	72
Console and peripheral equipment operator	87	87	15	69	3	-	-	-	-
Supervising peripheral equipment operator	1	-	-	-	-	-	-	-	1

Continued

Table 10 - continued

Occupation for which training was provided	Total workers	Total workers for whom duration of training was reported	Duration of training: Less than 1 week	1 or 2 weeks	3 or 4 weeks	5 or 6 weeks	7 or 8 weeks	More than 8 weeks	Duration of training not reported
Key punch operator									
Total	9	4	-	3	-	1	-	-	5
Programmer (all other grades)	2	2	-	1	-	1	-	-	-
Console operator (all other grades)	3	2	-	2	-	-	-	-	1
Data transcriber	4	-	-	-	-	-	-	-	4
Other data-processing occupations									
Total	5	4	1	2	-	-	1	-	1
Director or general supervisor	1	-	-	-	-	-	-	-	1
Supervising programmer	1	1	-	1	-	-	-	-	-
Console operator (all other grades)	1	1	-	-	-	-	1	-	-
Peripheral equipment operator	1	1	-	1	-	-	-	-	-
Tape librarian	1	1	1	-	-	-	-	-	-
Administrator, manager, and supervisor									
Total	41	35	-	2	10	22	1	-	6
Director or general supervisor	16	13	-	1	9	3	-	-	3
Supervising systems analyst and programmer	1	1	-	-	-	-	1	-	-
Systems analyst (all other grades)	9	8	-	-	-	8	-	-	1
Systems analyst and programmer	5	5	-	-	-	5	-	-	-
Supervising programmer	4	4	-	-	1	3	-	-	-
Programmer (all other grades)	4	4	-	1	-	3	-	-	-
Supervising console operator	2	-	-	-	-	-	-	-	2
Professional occupations									
Total	71	67	-	8	17	33	9	-	4
Director or general supervisor	10	8	-	4	1	3	-	-	2
Supervising systems analyst	1	1	-	-	1	-	-	-	-
Supervising systems analyst and programmer	4	4	-	-	-	-	4	-	-
Systems analyst (all other grades)	12	11	-	1	1	9	-	-	1
Systems analyst and programmer	6	6	-	-	3	-	3	-	-
Supervising programmer	2	2	-	2	-	-	-	-	-
Programmer (all other grades)	33	33	-	-	10	21	2	-	-
Supervising console operator	2	1	-	1	-	-	-	-	1
Console operator (all other grades)	1	1	-	-	1	-	-	-	-

Continued

Table 10 - continued

Occupation for which training was provided	Total workers	Total workers for whom duration of training was reported	Duration of training						Duration of training not reported
			Less than 1 week	1 or 2 weeks	3 or 4 weeks	5 or 6 weeks	7 or 8 weeks	More than 8 weeks	
Bookkeeper, bookkeeping clerk, bookkeeping and other office machine operators									
Total	68	62	1	29	9	23	-	-	6
Director or general supervisor	3	3	-	1	1	1	-	-	-
Supervising systems analyst	11	5	-	4	1	-	-	-	6
Systems analyst and programmer	6	6	-	5	-	1	-	-	-
Supervising programmer	1	1	-	-	1	-	-	-	-
Programmer (all other grades)	29	29	-	6	2	21	-	-	-
Programmer and console operator	2	2	-	-	2	-	-	-	-
Console operator (all other grades)	11	11	1	8	2	-	-	-	-
Console and peripheral equipment operator	4	4	-	4	-	-	-	-	-
Supervising key punch operator or data transcriber	1	1	-	1	-	-	-	-	-
Clerk (other than bookkeeping)									
Total	168	141	16	21	54	29	21	-	27
Director or general supervisor	1	1	-	1	-	-	-	-	-
Supervising systems analyst	1	1	-	-	-	1	-	-	-
Supervising systems analyst and programmer	2	2	-	-	2	-	-	-	-
Systems analyst (all other grades)	3	3	-	-	-	3	-	-	-
Systems analyst and programmer	17	16	-	6	-	2	8	-	1
Supervising programmer	2	1	-	-	1	-	-	-	1
Programmer (all other grades)	100	85	-	2	48	23	12	-	15
Programmer and console operator	1	1	-	-	1	-	-	-	-
Supervising console operator	3	3	1	2	-	-	-	-	-
Console operator (all other grades)	35	26	15	8	2	-	1	-	9
Console and peripheral equipment operator	1	1	-	1	-	-	-	-	-
Peripheral equipment operator	1	1	-	1	-	-	-	-	-
Equipment maintainer	1	-	-	-	-	-	-	-	1
Factory and processing occupations									
Console operator (all other grades)	5	5	-	4	-	1	-	-	-

Table 11. **PRESENT AND PRIOR OCCUPATION OF REASSIGNED WORKERS:**

A. Reassigned to electronic data-processing installation from positions in a data-processing unit

Occupation to which reassigned	Total	Prior occupation							
		Director or general supervisor	Supervising systems analyst	Systems analyst	Systems analyst and programmer	Programmer	Supervising controller or scheduler	Control clerk	Supervising console operator
Total	1,660	243	13	78	3	7	10	3	1
Total reporting	1,588	242	13	77	3	5	10	3	1
Data-processing occupations									
Director or general supervisor	255	216	1	8	-	2	-	-	-
Systems analyst	108	8	12	50	3	1	-	-	-
Supervising systems analyst	7	2	2	3	-	-	-	-	-
Supervising systems analyst and programmer	2	-	1	-	-	-	-	-	-
Systems analyst (all other grades)	65	4	9	30	3	1	-	-	-
Systems analyst and programmer	34	2	-	17	-	-	-	-	-
Programmer (all other grades)	240	13	-	17	-	2	-	-	1
Supervising programmer	8	1	-	-	-	-	-	-	-
Programmer (all other grades	230	12	-	17	-	2	-	-	1
Programmer and console operator	2	-	-	-	-	-	-	-	-
Controller or scheduler	35	-	-	-	-	-	9	1	-
Supervising controller or scheduler	12	-	-	-	-	-	9	-	-
Control clerk	23	-	-	-	-	-	-	1	-
Console operator	608	3	-	2	-	-	-	-	-
Supervising console operator	72	3	-	1	-	-	-	-	-
Console operator (all other grades)	307	-	-	1	-	-	-	-	-
Console and peripheral equipment operator	229	-	-	-	-	-	-	-	-
Peripheral equipment operator	127	1	-	-	-	-	-	-	-
Supervising peripheral equipment operator	25	1	-	-	-	-	-	-	-
Peripheral equipment operator	102	-	-	-	-	-	-	-	-
Key punch operator	119	1	-	-	-	-	1	-	-
Supervising key punch operator or data transcriber	25	1	-	-	-	-	1	-	-
Key punch operator	48	-	-	-	-	-	-	-	-
Data transcriber	46	-	-	-	-	-	-	-	-
Tape librarian	26	-	-	-	-	-	-	2	-
Equipment maintainer	2	-	-	-	-	-	-	-	-
Miscellaneous clerical personnel	68	-	-	-	-	-	-	-	-
Supervisor of clerical personnel	1	-	-	-	-	-	-	-	-
Secretary, stenographer, typist, receptionist	-	-	-	-	-	-	-	-	-
Clerk	67	-	-	-	-	-	-	-	-
Not reporting	72	1	-	1	-	2	-	-	-

Continued

Table 11A - continued

Occupation to which reassigned	Prior occupation									
	Console operator	Console and peripheral equipment operator	Supervising peripheral equipment operator	Peripheral equipment operator	Supervising key punch operator or data transcriber	Key punch operator	Data transcriber	Tape librarian	Equipment maintainer	Clerk
Total	5	3	121	952	11	125	16	1	2	66
Total reporting	5	3	108	925	5	116	6	1	2	63
Data-processing occupations										
Director or general supervisor	-	2	11	15	-	-	-	-	-	-
Systems analyst	-	-	5	29	-	-	-	-	-	-
Supervising systems analyst	-	-	-	-	-	-	-	-	-	-
Supervising systems analyst and programmer	-	-	-	1	-	-	-	-	-	-
Systems analyst (all other grades)	-	-	2	16	-	-	-	-	-	-
Systems analyst and programmer	-	-	3	12	-	-	-	-	-	-
Programmer	2	1	23	178	-	2	-	-	-	1
Supervising programmer	-	-	4	3	-	-	-	-	-	-
Programmer (all other grades)	2	1	19	173	-	2	-	-	-	1
Programmer and console operator	-	-	-	2	-	-	-	-	-	-
Controller or scheduler	-	-	3	12	-	8	-	-	-	2
Supervising controller or scheduler	-	-	3	-	-	-	-	-	-	-
Control clerk	-	-	-	12	-	8	-	-	-	2
Console operator	1	-	65	534	-	1	1	1	-	-
Supervising console operator	1	-	52	15	-	-	-	-	-	-
Console operator (all other grades)	-	-	12	291	-	1	1	1	-	-
Console and peripheral equipment operator	-	-	1	228	-	-	-	-	-	-
Peripheral equipment operator	-	-	1	117	-	3	-	-	-	5
Supervising peripheral equipment operator	-	-	1	23	-	-	-	-	-	-
Peripheral equipment operator	-	-	-	94	-	3	-	-	-	5
Key punch operator	1	-	-	7	5	93	5	-	-	6
Supervising key punch operator or data transcriber	1	-	-	3	2	17	-	-	-	-
Key punch operator	-	-	-	4	-	38	-	-	-	6
Data transcriber	-	-	-	-	3	38	5	-	-	-
Tape librarian	1	-	-	19	-	3	-	-	-	1
Equipment maintainer	-	-	-	-	-	-	-	-	2	-
Miscellaneous clerical personnel	-	-	-	14	-	6	-	-	-	48
Supervisor or clerical personnel	-	-	-	-	-	-	-	-	-	1
Secretary, stenographer, typist, receptionist	-	-	-	-	-	-	-	-	-	-
Clerk	-	-	-	14	-	6	-	-	-	47
Not reporting	-	-	13	27	6	9	10	-	-	3

Table 11. PRESENT AND PRIOR OCCUPATION OF REASSIGNED WORKERS:

B. Reassigned to electronic data-processing installation from positions elsewhere in the establishment

Occupation to which reassigned	Total	Prior occupation					
		Administrative, managerial and supervisory occupations	Accountant or auditor	Other professional occupations	Supervisor of clerical occupations	Bookkeeper	Bookkeeping clerk
Total	758	82	6	16	28	11	69
Total reporting	615	75	6	12	22	8	26
Data-processing occupations							
Director or general supervisor	72	45	2	-	22	2	-
Systems analyst	55	11	2	11	-	-	3
Supervising systems analyst	-	-	-	-	-	-	-
Supervising systems analyst and programmer	5	1	-	4	-	-	-
Systems analyst (all other grades)	36	10	-	4	-	-	2
Systems analyst and programmer	14	-	2	3	-	-	1
Programmer	25	3	2	1	-	-	1
Supervising programmer	1	-	1	-	-	-	-
Programmer (all other grades)	24	3	1	1	-	-	1
Programmer and console operator	-	-	-	-	-	-	-
Controller or scheduler	86	4	-	-	-	4	6
Supervising controller or scheduler	5	4	-	-	-	1	-
Control clerk	81	-	-	-	-	3	6
Console operator	20	2	-	-	-	1	2
Supervising console operator	3	2	-	-	-	1	-
Console operator (all other grades)	17	-	-	-	-	-	2
Console and peripheral equipment operator	-	-	-	-	-	-	-
Peripheral equipment operator	80	1	-	-	-	1	8
Supervising peripheral equipment operator	7	1	-	-	-	-	-
Peripheral equipment operator	73	-	-	-	-	1	8
Key punch operator	209	9	-	-	-	-	6
Supervising key punch operator or data transcriber	14	9	-	-	-	-	1
Key punch operator	106	-	-	-	-	-	5
Data transcriber	89	-	-	-	-	-	-
Tape librarian	6	-	-	-	-	-	-
Equipment maintainer	-	-	-	-	-	-	-
Miscellaneous clerical personnel	62	-	-	-	-	-	-
Supervisor of clerical personnel	2	-	-	-	-	-	-
Secretary, stenographer, typist, receptionist	-	-	-	-	-	-	-
Clerk	60	-	-	-	-	-	-
Not reporting	143	7	-	4	6	3	43

Continued

Table 11B - continued

Occupation to which reassigned	Prior occupation							
	Office machine operator (bookkeeping maching)	Office machine operator (other)	Special industry clerk				Secretary, stenographer, typist receptionist	Other clerical occupations
			Bank or other financial institution	Insurance	Public utility	Other		
Total	169	21	176	19	17	4	26	114
Total reporting	158	20	175	6	17	3	20	67
Data-processing occupations								
Director, or general supervisor	-	-	1	-	-	-	-	-
Systems analyst	2	-	19	1	-	-	-	6
Supervising systems analyst	-	-	-	-	-	-	-	-
Supervising systems analyst and programmer	-	-	-	-	-	-	-	-
Systems analyst (all other grades)	-	-	19	1	-	-	-	6
Systems analyst and programmer	2	-	-	-	-	-	-	-
Programmer	-	-	3	2	-	-	-	13
Supervising programmer	-	-	-	-	-	-	-	-
Programmer (all other grades)	-	-	3	2	-	-	-	13
Programmer and console operator	-	-	-	-	-	-	-	-
Controller or scheduler	55	-	17	-	-	-	-	-
Supervising controller or scheduler	-	-	-	-	-	-	-	-
Control clerk	55	-	17	-	-	-	-	-
Console operator	3	-	7	-	-	3	-	2
Supervising console operator	-	-	-	-	-	-	-	-
Console operator (all other grades)	3	-	7	-	-	3	-	2
Console and peripheral equipment operator	-	-	-	-	-	-	-	-
Peripheral equipment operator	34	-	10	-	8	-	-	18
Supervising peripheral equipment operator	6	-	-	-	-	-	-	-
Peripheral equipment operator	28	-	10	-	8	-	-	18
Key punch operator	52	20	89	-	4	-	19	10
Supervising key punch operator or data transcriber	4	-	-	-	-	-	-	-
Key punch operator	26	11	38	-	-	-	19	7
Data transcriber	22	9	51	-	4	-	-	3
Tape librarian	2	-	1	-	-	-	1	2
Equipment maintainer	-	-	-	-	-	-	-	-
Miscellaneous clerical personnel	10	-	28	3	5	-	-	16
Supervisor of clerical personnel	2	-	-	-	-	-	-	-
Secretary, stenographer, typist, receptionist	-	-	-	-	-	-	-	-
Clerk	8	-	28	3	5	-	-	16
Not reporting	11	1	1	13	-	1	6	47

Table 11. PRESENT AND PRIOR OCCUPATION OF REASSIGNED WORKERS:

C. Reassigned to positions elsewhere in the establishment from positions in the data-processing unit

Occupation to which reassigned	Total	Prior occupation											
		Director or general super-visor	Systems analyst	Pro-grammer	Super-vising control-ler or sched-uler	Super-vising periph-eral equip-ment opera-tor	Periph-eral equip-ment opera-tor	Super-vising key punch opera-tor or data tran-scriber	Key punch oper-tor	Data tran-scriber	Super-visor of clerical per-sonnel	Secre-tary, stenog-rapher, typist, recep-tionist	Clerk
Total	329	10	15	1	3	17	183	3	50	2	2	1	42
Total reporting	83	1	-	-	-	6	49	-	15	-	-	-	12
Other occupations													
Administrative, managerial and supervisory occupations	1	-	-	-	-	-	-	-	-	-	-	-	1
Professional occupations:	5	1	-	-	-	4	-	-	-	-	-	-	-
Accountant or auditor	5	1	-	-	-	4	-	-	-	-	-	-	-
Engineer	-	-	-	-	-	-	-	-	-	-	-	-	-
Other professional occupation	-	-	-	-	-	-	-	-	-	-	-	-	-
Clerical occupations:	77	-	-	-	-	2	49	-	15	-	-	-	11
Supervisor of clerical occupations	-	-	-	-	-	-	-	-	-	-	-	-	-
Bookkeeper	-	-	-	-	-	-	-	-	-	-	-	-	-
Bookkeeping clerk	-	-	-	-	-	-	-	-	-	-	-	-	-
Office machine operator (bookkeeping machine)	-	-	-	-	-	-	-	-	-	-	-	-	-
Office machine operator (other)	-	-	-	-	-	-	-	-	-	-	-	-	-
Special industry clerk:	39	-	-	-	-	2	19	-	12	-	-	-	6
Bank or other financial institution	37	-	-	-	-	-	19	-	12	-	-	-	6
Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-
Public utility	-	-	-	-	-	-	-	-	-	-	-	-	-
Other industry	2	-	-	-	-	2	-	-	-	-	-	-	-
Secretary, stenographer, typist, receptionist	7	-	-	-	-	-	6	-	1	-	-	-	-
Other clerical occupations	31	-	-	-	-	-	24	-	2	-	-	-	5
Factory and processing occupations	-	-	-	-	-	-	-	-	-	-	-	-	-
Not reporting	246	9	15	1	3	11	134	3	35	2	2	1	30

Continued

Table 11. PRESENT AND PRIOR OCCUPATION OF REASSIGNED WORKERS:

D. Reassigned to positions elsewhere in the establishment from positions in nondata-processing units

Occupation to which reassigned	Total	Prior occupation												
		Administrative, managerial and supervisory occupations	Supervisor of clerical occupations	Bookkeeper	Bookkeeping clerk	Office machine operator (bookkeeping machine)	Office machine operator (other)	Special industry clerk				Secretary, stenographer, typist, receptionist	Other clerical occupations	Factory and processing occupations
								Bank or other financial institution	Insurance	Public utility	Other			
Total	2,289	48(a)	45	104	132	828	49	454	140	32	35	38	378	6
Total reporting	781	5	1	77	90	311	26	97	-	26	34	1	113	-
Other occupations														
Administrative, managerial and supervisory occupations	9	3	-	2	4	-	-	-	-	-	-	-	-	-
Professional occupations:	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Accountant or auditor	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Engineer	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other professional occupation	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Clerical occupations:	771	1	1	75	86	311	26	97	-	26	34	1	113	-
Supervisor of clerical occupations	9	-	1	-	-	4	-	4	-	-	-	-	-	-
Bookkeeper	5	-	-	-	-	5	-	-	-	-	-	-	-	-
Bookkeeping clerk	79	-	-	-	15	38	-	4	-	-	-	-	22	-
Office machine operator (bookkeeping machine)	3	-	-	1	-	-	1	-	-	-	-	-	1	-
Office machine operator (other)	1	-	-	-	-	-	1	-	-	-	-	-	-	-
Special industry clerk:	473	1	-	74	45	210	24	64	-	-	34	-	21	-
Bank or other financial institution	364	1	-	4	45	210	20	64	-	-	-	-	20	-
Insurance	74	-	-	70	-	-	4	-	-	-	-	-	-	-
Public utility	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other industry	35	-	-	-	-	-	-	-	-	-	34	-	1	-
Secretary, stenographer, typist, receptionist	42	-	-	-	2	28	-	10	-	-	-	-	2	-
Other clerical occupations	159	-	-	-	24	26	-	15	-	26	-	1	67	-
Factory and processing occupations	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Not reporting	1,508	43(c)	44	27	42	517	23	357	140	6	1	37	265	6

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a. Includes 1 professional worker.

Table 12. SKILL LEVEL CHANGES OF REASSIGNED WORKERS BY PRIOR OCCUPATION:

A. Those reassigned to positions in electronic data-processing installation

Prior occupation	Total	Total reporting	Skill level change			Not reporting
			To higher level job	To same level job	To lower level job	
Total	2,418	2,203	1,159	1,039	5	215
Data-processing occupations	1,660	1,588	1,042	542	4	72
Director or general supervisor	243	242	86	156	-	1
Systems analyst	94	93	17	76	-	1
Supervising systems analyst	13	13	1	12	-	-
Supervising systems analyst and programmer	-	-	-	-	-	-
Systems analyst (all other grades)	78	77	16	61	-	1
Systems analyst and programmer	3	3	-	3	-	-
Programmer	7	5	5	-	-	2
Supervising programmer	-	-	-	-	-	-
Programmer (all other grades)	7	5	5	-	-	2
Programmer and console operator	-	-	-	-	-	-
Controller or scheduler	13	13	10	3	-	-
Supervising controller or scheduler	10	10	9	1	-	-
Control clerk	3	3	1	2	-	-
Console operator	9	9	7	1	1	-
Supervising console operator	1	1	1	-	-	-
Console operator (all other grades)	5	5	3	1	1	-
Console and peripheral equipment operator	3	3	3	-	-	-
Peripheral equipment operator	1,073	1,033	885	145	3	40
Supervising peripheral equipment operator	121	108	99	9	-	13
Peripheral equipment operator	952	925	786	136	3	27
Key punch operator	152	127	23	104	-	25
Supervising key punch operator or data transcriber	11	5	-	5	-	6
Key punch operator	125	116	22	94	-	9
Data transcriber	16	6	1	5	-	10
Tape librarian	1	1	1	-	-	-
Equipment maintainer	2	2	-	2	-	-
Miscellaneous clerical personnel	66	63	8	55	-	3
Supervisor of clerical personnel	-	-	-	-	-	-
Secretary,stenographer,typist,receptionist	-	-	-	-	-	-
Clerk	66	63	8	55	-	3
Other occupations	758	615	117	497	1	143
Administrative,managerial and supervisory occupations	82	75	13	62	-	7
Professional occupations:	22	18	6	12	-	4
Accountant or auditor	6	6	-	6	-	-
Engineer	-	-	-	-	-	-
Other professional occupation	16	12	6	6	-	4
Clerical occupations:	654	522	98	423	1	132
Supervisor of clerical occupations	28	22	1	21	-	6
Bookkeeper	11	8	3	4	1	3
Bookkeeping clerk	69	26	10	16	-	43
Office machine operator (bookkeeping machine)	169	158	18	140	-	11
Office machine operator (other)	21	20	-	20	-	1
Special industry clerk:	216	201	40	161	-	15
Bank or other financial institution	176	175	34	141	-	1
Insurance	19	6	3	3	-	13
Public utility	17	17	-	17	-	-
Other industry	4	3	3	-	-	1
Secretary, stenographer, typist, receptionist	26	20	1	19	-	6
Other clerical occupations	114	67	25	42	-	47

Table 12. SKILL LEVEL CHANGES OF REASSIGNED WORKERS BY PRIOR OCCUPATION:

B. Those reassigned to other positions in establishment

Prior occupation	Total	Total reporting	Skill level change			Not reporting
			To higher level job	To same level job	To lower level job	
Total	2,618	864	25	831	8	1,754
Data-processing occupations	329	83	11	72	-	246
Director or general supervisor	10	1	1	-	-	9
Systems analyst	15	-	-	-	-	15
Supervising systems analyst	-	-	-	-	-	-
Supervising systems analyst and programmer	-	-	-	-	-	-
Systems analyst (all other grades)	15	-	-	-	-	15
Systems analyst and programmer	-	-	-	-	-	-
Programmer	1	-	-	-	-	1
Supervising programmer	-	-	-	-	-	-
Programmer (all other grades)	1	-	-	-	-	1
Programmer and console operator	-	-	-	-	-	-
Controller or scheduler	3	-	-	-	-	3
Supervising controller or scheduler	3	-	-	-	-	3
Control clerk	-	-	-	-	-	-
Console operator	-	-	-	-	-	-
Supervising console operator	-	-	-	-	-	-
Console operator (all other grades)	-	-	-	-	-	-
Console and peripheral equipment operator	-	-	-	-	-	-
Peripheral equipment operator	200	55	9	46	-	145
Supervising peripheral equipment operator	17	6	4	2	-	11
Peripheral equipment operator	183	49	5	44	-	134
Key punch operator or data transcriber	55	15	-	15	-	40
Supervising key punch operator or data transcriber	3	-	-	-	-	3
Key punch operator	50	15	-	15	-	35
Data transcriber	2	-	-	-	-	2
Tape librarian	-	-	-	-	-	-
Equipment maintainer	-	-	-	-	-	-
Miscellaneous clerical personnel	45	12	1	11	-	33
Supervisor of clerical personnel	2	-	-	-	-	2
Secretary, stenographer,typist,receptionist	1	-	-	-	-	1
Clerk	42	12	1	11	-	30
Other occupations	2,289	781	14	759	8	1,508
Administrative,managerial and supervisory occupations	47	5	-	4	1	42
Professional occupations:	1	-	-	-	-	1
Accountant or auditor	-	-	-	-	-	-
Engineer	-	-	-	-	-	-
Other professional occupation	1	-	-	-	-	1
Clerical occupations:	2,235	776	14	755	7	1,459
Supervisor of clerical occupations	45	1	-	1	-	44
Bookkeeper	104	77	1	74	2	27
Bookkeeping clerk	132	90	4	86	-	42
Office machine operator (bookkeeping machine)	828	311	5	306	-	517
Office machine operator (other)	49	26	-	26	-	23
Special industry clerk:	661	157	4	148	5	504
Bank or other financial institution	454	97	4	88	5	357
Insurance	140	-	-	-	-	140
Public utility	32	26	-	26	-	6
Other industry	35	34	-	34	-	1
Secretary, stenographer, typist, receptionist	38	1	-	1	-	37
Other clerical occupations	378	113	-	113	-	265
Factory and processing occupations	6	-	-	-	-	6